THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIII. No. 1345.] LONDON, FEBRUARY 19, 1889. [41ST YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.

Warranted Free from Adulteration. **TORBAY PAINTS.**

FOR GASHOLDERS, &c., &c.

The Original "Torbay Paints"

As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.

TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
DARTMOUTH, & BRIXHAM (TORBAY).

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

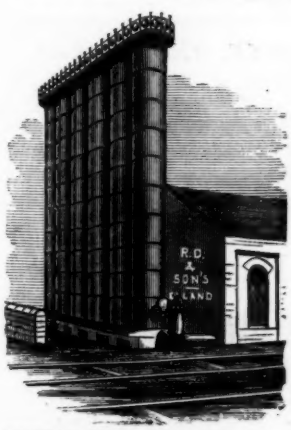
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 262.

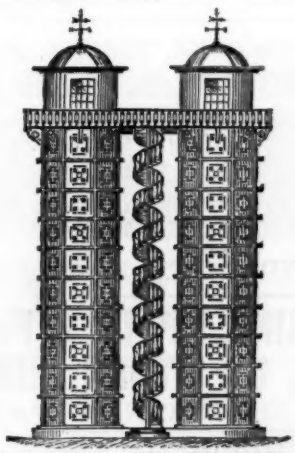
CEMENT
EARLE'S
BEST
PORTLAND CEMENT
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.
PROMPT DESPATCH:
Seven Jetties on the River.
Two Private Railway Sidings.
FACILITIES FOR DESPATCH:
Six Railway-Waggon Entrances with Steam and Hydraulic Cranes.
Four Rully Entrances.
Three different Railway Companies within easy cartage distance.
Storage Capacity 8000 tons.
Office: 7, PIER STREET.
Works: WILMINGTON.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.

"Abyssinian" Tube Wells.
Pure Water Supplies
LE GRAND & SUTCLIFF,
100, BUNHILL ROW,
LONDON.

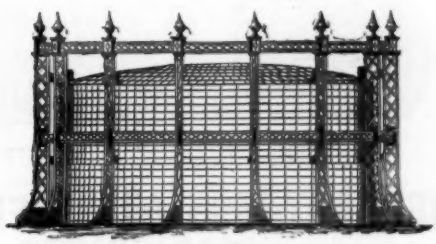
R. DEMPSTER & SONS, LTD.,
ELLAND, YORKS.,
MANUFACTURERS and CONTRACTORS for EVERY DESCRIPTION of GAS and CHEMICAL PLANT.



WROUGHT-IRON ANNULAR AND HORIZONTAL CONDENSERS.
Thoroughly effective.
Improved Construction.


SCRUBBERS ANY DIMENSIONS.
OURS continue to give the BEST RESULTS.

ESTIMATES, SPECIFICATIONS, & ILLUSTRATIONS ON APPLICATION.


GASHOLDERS
OF EVERY DESCRIPTION AND SIZE.

Makers of Livesey's Patent Washers for the Colonies and Abroad.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS,

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.,

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

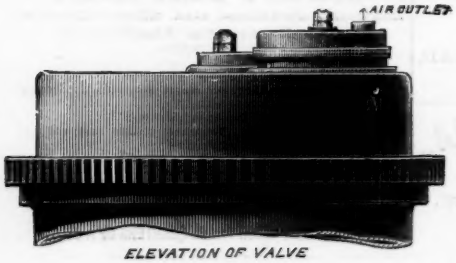
AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

EDWARD COCKEY & SONS, LTD.,

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS,

MAKERS OF GASHOLDERS, TANKS, & GAS APPARATUS OF EVERY DESCRIPTION,
SULPHATE & LIQUID AMMONIA PLANTS.



ELEVATION OF VALVE

Wood Grids for Purifiers. / Wood Boards for Scrubbers. / Cast-Iron Main Pipes and Connections. / Station Meters. / Governors. / Valves of every description. / Brass Fittings. / Lamp Columns. / Boilers. / Weighbridges. / Coke Breakers. / &c., &c.

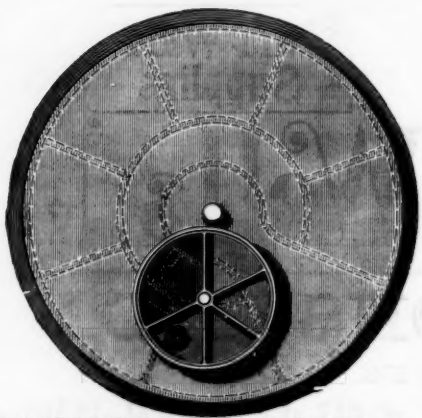
Patent Washers with improved Overflow Arrangements, requiring no Motive Power, and giving unexcelled results.

PATENT SELF-ACTING BYE-PASS VALVES FOR EXHAUSTING APPARATUS.

Patent Centre-Valves, working all Four Purifiers in a Set, or Three, Two, or One, in Rotation.

PATENT FOUR-WAY BYE-PASS VALVES.

PATENT AIR-CLEARING VALVES FOR WORKING IN CONNECTION WITH CENTRE-VALVES.



PLAN OF TOP OF CENTRE VALVE FOR FOUR PURIFIERS

The illustration shows one of our new Patent Air-Clearing Valves as fixed on the Cover of a Centre-Valve. When in action, the clean gas from the Outlet Chamber of the Valve is passed down the Outlet-Box of the Purifier last changed, and forced through the Inlet into the Air-Clearing Valve, from which a proper outlet is provided on the top, leaving the Purifier ready charged with clean gas in place of air, as is usual; thus preventing the spoiling or wasting of a large quantity of gas.

Many of these Valves have been fixed, and are giving every satisfaction.

TESTIMONIALS ON APPLICATION.

Drawings, Specifications, and Estimates for Apparatus (and the necessary Buildings and Tanks if desired) furnished on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

Telegraphic Address: "COCKEYS, FROME."

INQUIRIES INVITED.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street.
BIRMINGHAM: 114, Colmore Row.
LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO.,

(ESTABLISHED 1822)

SPRING HILL, BIRMINGHAM,

MANUFACTURERS OF

GAS APPARATUS

OF EVERY DESCRIPTION

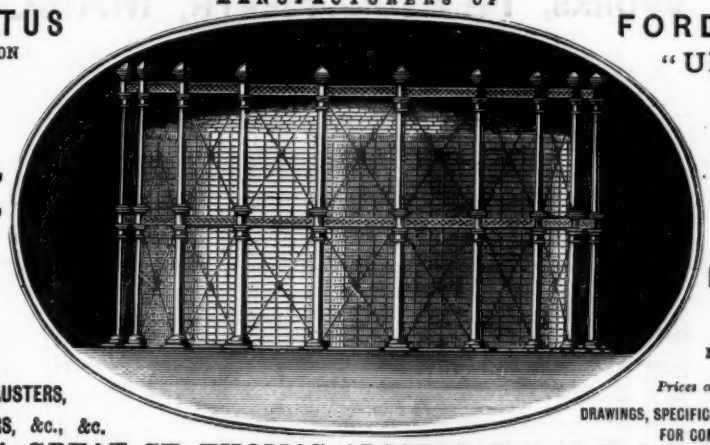
INCLUDING

GASHOLDERS and Tanks, Retorts, Purifiers, Valves, Scrubbers, Condensers,

ETC., ETC.

All of the most approved Designs.

BOILERS, ENGINES, PUMPS, BEALE'S and other EXHAUSTERS, METERS, GAUGES, GOVERNORS, &c., &c.



FORD'S PATENT "UNIVERSAL" SCRUBBER-WASHER.

Numbers at work, giving excellent results.

No Motive Power Required.

ALSO OF

SOMERVILLE'S PATENT RETORT MOUTHPIECES AND SELF-SEALING LIDS.

NO LUTING REQUIRED.

Prices and Particulars on application.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES PREPARED FOR COMPLETE GAS PLANT.

London Offices: 14, GREAT ST. THOMAS APOSTLE, E.C.—J. E. & S. SPENCER, Agents.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

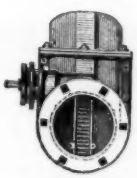
NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, With Rack & Pinion, or Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.

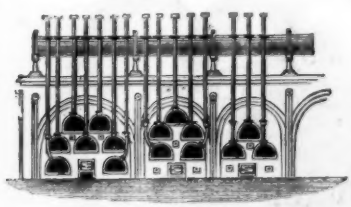


CAST-IRON RETORTS,

RETORT-BED FITTINGS,

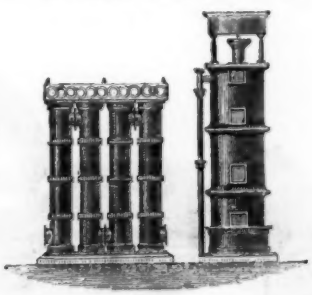
AND RETORT-HOUSE APPLIANCES of every description.

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.



WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS

TAR AND LIQUOR PUMPS, &c.



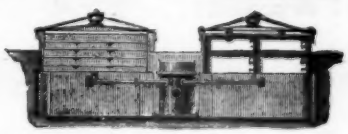
PATENT CENTRE VALVES for working Purifiers. Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints.

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

R. & J. DEMPSTER,

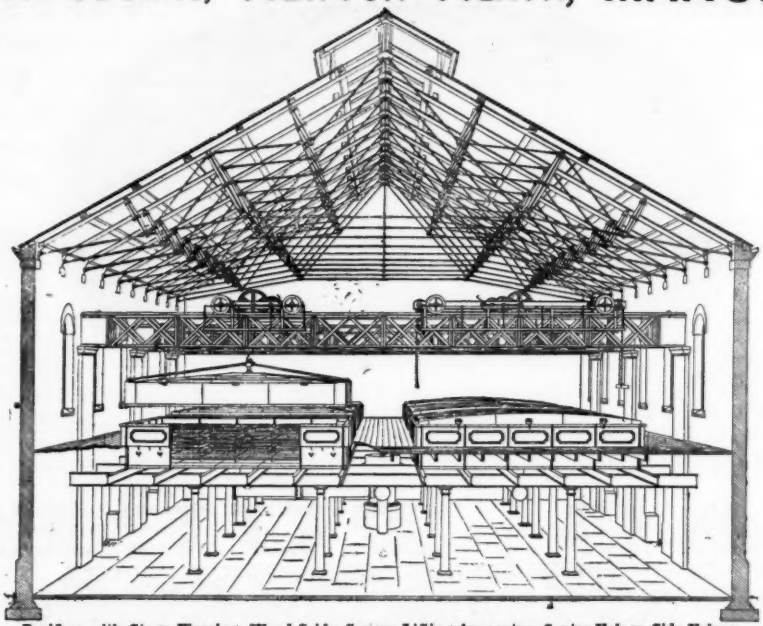
Engineers, Ironfounders, & Contractors,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

WROUGHT-IRON

Roofs,
Girders,
Bridges,
Retort-Lids,
Ascensions,
Hydraulics,
Foul Mains,
Condensers,
Boilers,
Gasholders,
Tanks,
Stills,
Services.

CHEMICAL PLANT.



CAST-IRON

Columns,
Beams,
Floor Plates,
Retorts,
Fittings,
Brackets,
Washers,
Scrubbers,
Purifiers,
Valves,
Tanks,
Mains,
Lamp-posts.

STRUCTURAL IRONWORK.

Purifiers with Stage Flooring, Wood Grids, Covers, Lifting Apparatus, Centre-Valves, Side-Valves, Connections, and Roofs of every variety and for any size of Gas-Works.

Sole Makers of Livesey's Patent Washer north of Birmingham.

ESTIMATES, WITH SPECIFICATIONS AND ILLUSTRATIONS, FURNISHED UPON APPLICATION.

LONDON OFFICES: 181 and 182, GRESHAM HOUSE, OLD BROAD STREET, E.C.

Telegraphic Addresses: "SCRUBBER MANCHESTER" and "SCRUBBER LONDON."

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND.

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description

GLAZED BRICKS AND PORCELAIN BATHS.

CROSSLEY'S "OTTO" GAS-ENGINE.

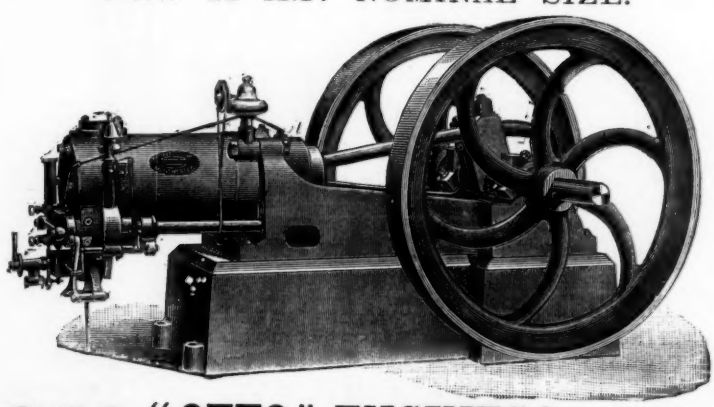
MADE in SIZES
2 Man to 100 HP.

GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY,
SEWAGE, &c., &c

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
SCHONE SEWAGE
SYSTEM, LUCIGEN
LIGHT, &c.

70 Prize Medals.

NEW 14 H.P. NOMINAL SIZE.



MADE in SIZES
2 Man to 100 HP.

VERTICAL
AND
HORIZONTAL
TYPES.

ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS, &c., &c.

Largely used for
EXHAUSTING,
PUMPING,
COKE CRUSHING,
ELECTRIC LIGHTING,
&c., &c.

Over 27,000 "OTTO" ENGINES have now been made.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

LONDON,
LIVERPOOL,
GLASGOW,
NEWCASTLE.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

(Mr. SIDNEY HERSEY, Managing Director.—Address at foot.)

351 Patent "Standard" Washer-Scrubbers,

Equal to a Daily Capacity of 306,600,000 Cubic Feet of Gas,

Erected and in course of construction at present date, amongst them being the following, viz.:—

	Capacity. Cubic feet per day.
Altrincham	600,000
Adelaide	600,000
Aldershot	200,000
Allegheny, U.S.A.	1,000,000
Ashton-under-Lyne	1,250,000
Amsterdam	1,500,000
,,	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co.	200,000
Altoona, U S.A.	350,000
Buxton	250,000
Bradford	1,000,000
,,	1,250,000
,,	1,250,000
,,	1,250,000
,,	1,000,000
,,	1,000,000
,,	3,000,000
Bremen	150,000
Baltimore, U.S.A.	1,000,000
,,	1,000,000
,,	1,000,000
Balmain, N.S.W.	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels	1,250,000
,,	1,250,000
,,	750,000
,,	1,250,000
Banbury	250,000
Birmingham	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A.	2,000 000
Brisbane	1,500,000
,,	300,000
Burton-on-Trent	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co.	20,000
,,	420,000
Bombay	700,000
Buffalo, U.S.A.	550,000
,,	500,000
Brooklim, U.S.A.	300,000
Bergen	250,000
Berlin	150,000
Bournemouth	1,000,000
Bridgeport, U.S.A.	500.000
Brunswick	300,000
Beck & Co., St. Louis	100.000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A.	1,000.000
,,	1,000,000
Brunner, Mond, & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A.	500,000
Cincinnati, U.S.A.	1,500,000
,,	1,500,000
Chicago, U.S.A.	3,000,000
,,	1,000,000
,,	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas-Works Co.	100,000
Cadiz	300,000
Charottenberg	600,000
Dudley	750,000
Driffield	100,000
Dukinfield	500,000
Dover	750,000
,,	1,000,000
Deal	200,000
Derby	1,500,000

	Capacity. Cubic feet per day.
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A.	350,000
Denver, ,,	500,000
,, ,,	1,000,000
Düsselldorf	750,000
,,	500,000
Dumfries	250,000
Dunedin, N.Z.	400,000
Darlington	1,250,000
Detroit, U.S.A.	750,000
Edinburgh	1,500,000
,,	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshütte	500,000
Fürth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W.	100,000
Grieg	300,000
Georgetown, U.S.A.	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havanna, Cuba	750,000
Hastings	1,500,000
Huddersfield	300,000
,,	750,000
,,	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwike	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A.	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200,000
Ilford	100.000
Kingston-on-Hull	400,000
Kidderminster	750,000
Kidsgrove	100,000
Königsberg	1,000,000
King's Lynn	300,000

LONDON:—

The Gaslight and Coke Co.:—

Beckton	1,250,000
,,	1,250,000
,,	1,250,000
,,	1,250,000
,,	1,250,000
,,	2,500,000
,,	2,500,000
Silvertown	1,000,000
Bromley	2,000,000
,,	1,500,000
,,	1,500,000
,,	1,500,000
,,	2,000,000
,,	1,500,000

LONDON—*Continued.*	Capacity. Cubic feet per day.
Shoreditch	2,500,000
Pancras	1,500,000
,,	1,500,000
Pimlico	2,000,000
Nine Elms	3,000,000
,,	3,000,000
South Metropolitan Co.:—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
,,	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
Leeds	2,000,000
,,	3,000,000
,,	3,000,000
,,	3,000,000
,,	3,000,000
,,	2,000,000
Leominster	150,000
Leiden	560,000
,,	600,000
Liverpool	2,000,000
,,	2,000,000
,,	2,000,000
,,	2,000,000
,,	2,000,000
,,	3,000,000
Lincoln	1,000,000
,,	600,000
Lowell, U.S.A.	1,000,000
Laclede, ,,	1,000,000
Louisville ,,	1,500,000
Long Eaton	500,000
Lille	900,000
,,	450,000
,,	750,000
,,	250,000
,,	250,000
Luckenwalde	330,000
Liegwitz	300,000
Lincoln, U.S.A.	250,000
Lawrence ,,	500,000
Lynn ,,	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles	1,500,000
,,	1,500,000
Mons	500,000
Malines	250,000
Melbourne	1,500,000
,,	1,500,000
,,	1,500,000
,,	1,500,000
,,	1,500,000
Manchester	2,500,000
Middleton	400,000
Manley, N.S.W.	100,000
Minneapolis, U.S.A.	750,000
Magdeburg	300,000
Memphis, U.S.A.	750,000
Nottingham	1,250,000
,,	2,500,000
,,	2,500,000
,,	2,000,000
,,	1,500,000
,,	2,000,000
Newport, U.S.A.	430,000
Newmarket	150,000
Newark, U.S.A.	680,000
Northfleet	200,000
New York, U.S.A.	2,000,000
Nice	600,000
Newcastle, N.S.W.	200,000
Numea, ,,	100,000
Namur	250,000
Newark	350,000
Nassau, U.S.A.	1,000,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000

	Capacity. Cubic feet per day.
Ober Schlesian	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N.S.W.	100,000
Prescot	150,000
Providence, U.S.A.	750,000
,,	750,000
Plauen	300,000
,,	300,000
Portsmouth	2,500,000
,,	2,500,000
Pittsburgh, U.S.A.	1,500,000
Portland ,,	560,000
Pawtucket ,,	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A.	250,000
Roxbury, ,,	500,000
Runcorn Soap Co.	20,000
Rockhampton, N.S.W.	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Salford	1,750,000
,,	1,750,000
,,	1,750,000
Smethwick	750,000
Sydney, N.S.W	1,000,000
,,	1,000,000
,,	2,500,000
,,	50,000
,,	50,000
Sunderland	1,500,000
St. Joseph's, U.S.A.	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
,,	1,500,000
St. Louis, U.S.A.	2,000,000
,,	2,000,000
,,	1,000,000
Silesian Coal Co.	600,000
San Francisco, U.S.A.	2,000,000
,,	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A.	750,000
Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich	1,000,000
Willenhall	250,000
Weston-super-Mare	500,000
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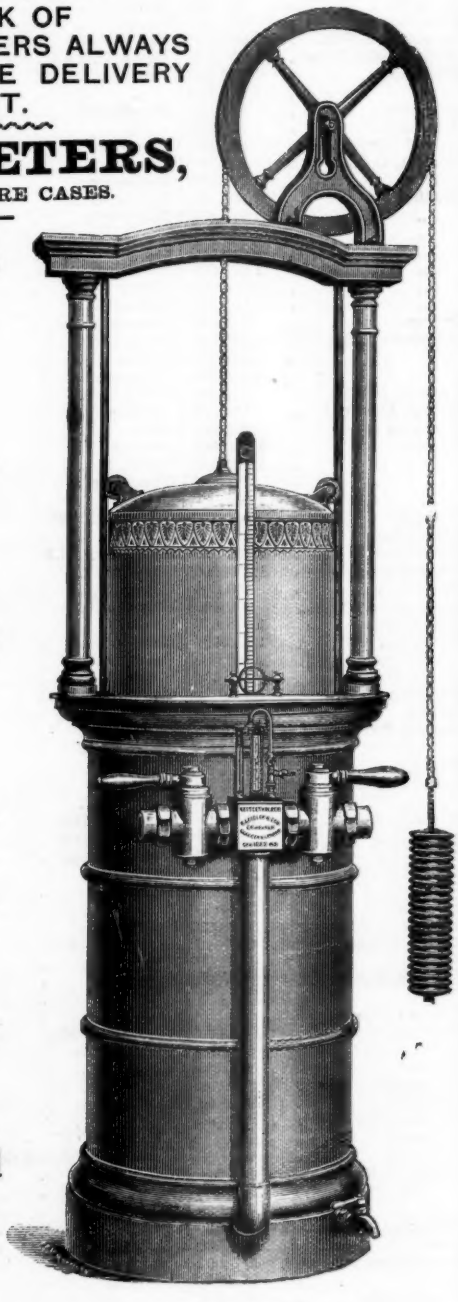

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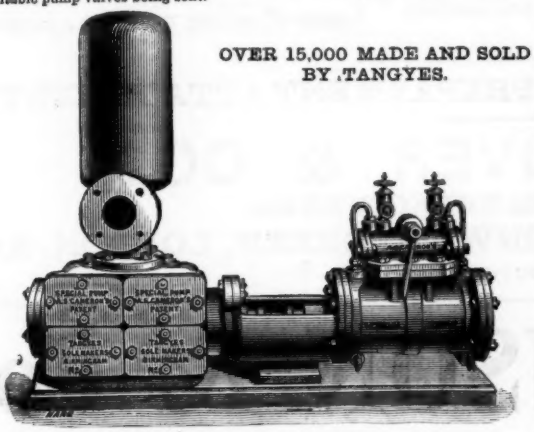

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Length Stroke . . "	9	9	9	9	9	12	12	12	12
Gals. per hour, approx.	450	1800	800	1800	3200	1350	1800	3200	5000
Diameter Suction and Delivery . . . ins.	1	2½	1½	2½	2½	2	2½	3	3½
Price . . . . . £	9	12	11	13	15	15	16	19	22

Diam. Steam Cyl. ins.	6	6	6	6	7	7	7	7	7
Diam. Water Cyl. "	3	4	5	6	3	4	5	6	7
Length Stroke . . "	12	12	12	12	12	12	12	12	12
Gals. per hour, approx.	1800	3200	5000	7200	1800	3200	5000	7200	9800
Diameter Suction and Delivery . . . ins.	2½	3	3½	4	2½	3	3½	4	5
Price . . . . . £	17	20	23	26	19	22	25	28	34

Diam. Steam Cyl. ins.	8	8	8	8	8	9	9	9	9
Diam. Water Cyl. "	4	5	6	7	8	5	6	7	8
Length Stroke . . "	12	12	12	12	18	12	12	12	18
Gals. per hour, approx.	3200	5000	7200	9800	12800	5000	7200	9800	12800
Diameter Suction and Delivery . . . ins.	3	3½	4	5	6	3½	4	5	6
Price . . . . . £	24	27	31	36	43	29	34	39	46

Diam. Steam Cyl. ins.	9	10	10	10	0	10	10
Diam. Water Cyl. "	9	5	6	7	8	9	10
Length Stroke . . "	24	12	12	12	18	24	24
Gals. per hour, approx.	16200	5000	7200	9800	12800	16200	20000
Diameter Suction and Delivery . . . ins.	7	3½	4	5	6	7	8
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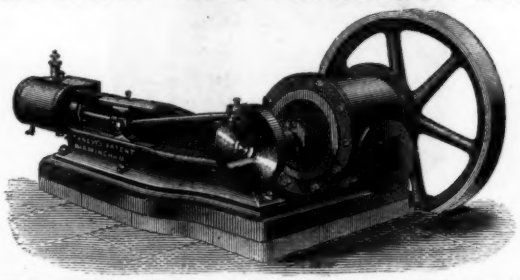

These Exhausters are supplied with or without Engine. The smaller sizes (Nos. 1 to 6), when supplied with Engine, are mounted on strong cast-iron base plate—as illustrated—which also carries the Engine.

No.	Cubic Feet per Hour.	Inlets and Outlets.	Horse power of Engine.	PRICE.
1	2,000	3 inches.	2	£60
2	3,000	4 "	2	65
3	5,000	5 "	2	75
4	7,500	6 "	2	80
5	10,000	7 "	3	95
6	15,000	8 "	3	115
7	20,000	9 "	4	125
8	30,000	10 "	6	175
9	40,000	12 "	8	210
10	50,000	14 "	10	260

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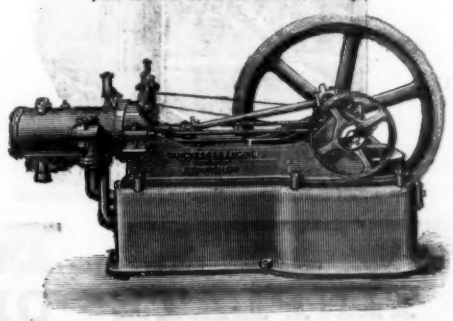

The ½, 2½, and 4 horse power sizes are of the type shown in illustration. The 1-horse power size is of the type of the "Tangye" Steam-Engine.

Working size	½ H.P.	1 H.P.	2½ H.P.	4 H.P.
Test Horse Power	1	1·4	3	6
Revolutions per minute	180	170	170	160
Price, Engine on Base with Tank £	60	82	115	140

Note.—The Test Horse Power in the table above is that given off at the Driving Pulley in actual test with Dynamic Brake at our Works.

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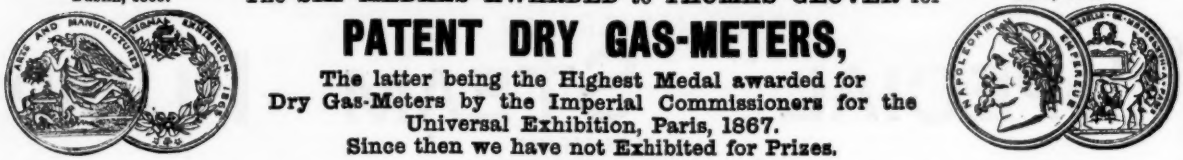

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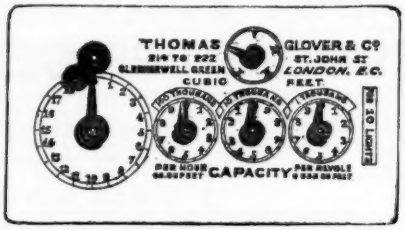

the exact amount of Gas they have received prepayment for, and thus avoid the unpleasantness of asking users for a deposit.

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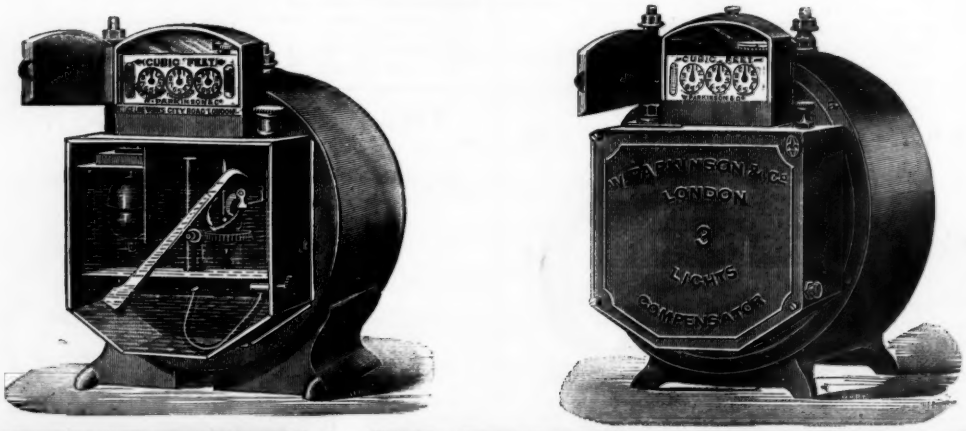

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TO CORRESPONDENTS.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 19, 1889.

THE SOUTH METROPOLITAN REPORT AND ACCOUNTS.

In the last issue of the JOURNAL we published the report and accounts relating to the past half-year's working of the South Metropolitan Gas Company. There will be no dispute respecting the justice of the description of this statement by the Directors, in the first words of the report, as satisfactory. An increase of 5½ per cent. in the Gas Consumption, coupled with better prices for residuals, is enough to satisfy the most exacting critic of a Gas Company's business; and it fully explains the action of the Board in reducing the price of gas as they did from the beginning of the year. The Directors recite the number and amounts of the reductions of price which have marked the progress of the undertaking since the amalgamation of the Phœnix Company; showing that during the past eight years reductions have been made which would represent £208,000 per annum on the present rental of the Company—the benefit accruing therefrom to the shareholders being less than a fifth part of this sum. This has been done notwithstanding the expenditure of a large sum of money upon new works which are yet to a great extent unproductive, as the report fully explains. The proprietors have the satisfaction of knowing that if this heavy expense has been so managed that they have not felt it, their position in this respect must necessarily grow better, instead of worse, with advancing time. The absence of everything but this one subject from the report is rather remarkable. Probably the Directors have nothing particular to tell the proprietors respecting the doings of the Company last half year, beyond recommending a slightly increased dividend (13¼ per cent.); and what there is to be said the Chairman, Mr. George Livesey, may prefer to give in the easier manner of an address from the chair. On the whole, however, we are disposed to regard the latter part of 1888 as not an eventful period for Gas Companies—a cold autumn degenerating into a wet, foggy, and miserable winter; but it is Mr. Livesey's habit not to take particular interest in fogs, which he thinks are not productive of good to anybody—not even to Gas Companies. In this respect he offers another contrast to his good friends across the water, who rather pride themselves on the extra quantity of gas which they can send out during a spell of the true "London particular."

The revenue account shows that £341,596 was received for gas in the six months ending Dec. 31 last, as compared with £323,291 in the corresponding period of 1887, or an increase of £18,305; the price of gas being the same—2s. 5d. per 1000 cubic feet for both periods. Stove and meter rental is £589 more; and residuals have risen from £100,265 to £120,784. In this advance, coke participates to the extent of £8886; and tar stands for nearly £10,000 more. It will be interesting to learn from Mr. Livesey whether, in view of this improvement in the market value of tar, he still holds to the opinion that the burning of it as fuel is advisable. The question is whether tar burning has had anything to do in forcing up the value of this residual, or whether this is the result of trade influences beyond the control of the producers of the commodity. If the former, then tar burning should be persevered with; but if the latter, it should be stopped as soon as its selling price transcends its fuel value. The revenue from ammoniacal liquor shows very little change for the better. Altogether, the Company's revenue for the past half year amounted to £472,239. On the other side, gas manufacture cost £245,894, as compared with £234,574, or an increase of £11,320, nearly half of which is due to coals. Purification and salaries are somewhat less. Wages are naturally higher, on account of the greater weight of coal to be handled; and the remainder of the increased cost of working comes under the head of repairs and maintenance. Distribution cost £22,202, as compared with £20,998. The chief cause of this small increase is in repairs and maintenance of mains and services; the other entries of wages and repairs and maintenance of meters and stoves showing a reduction. There has been economy also in lamp lighting and repairing. Rates and taxes are nearly the same. The other charges show very little fluctuation. The gross expenditure on revenue account was £307,052, as compared with £294,692; and the gross balance of profit is £165,187, compared with £138,561 a year ago.

The other accounts do not show any very remarkable figures. The coal carbonized weighed 293,510 tons, of which there were 1189 tons of cannel. The figures for the corresponding half of 1887were a total carbonized of 282,743 tons. whereof 3019 tons were cannel. It will thus be seen there has once more been a saving of cannel, which considerations of gas testing made great havoc with a year ago. The curious point is that, while the trouble with the testing arrangements remains as pressing now as it was in 1887 (if not more so), there should be all this difference in the requirement of cannel. In the statement of residual products it appears that the Company used—that is, burnt—525,147 gallons of tar during the half year; whereas a year ago they burnt 1,858,615 gallons. Correspondingly, the consumption

of coke for fuel has risen from 675,181 cwt. to 841,464 cwt.; to make up for the quantity of tar saved from the furnaces for sale. According to these figures, the question on this subject which we addressed to the Chairman when commenting upon the revenue account must be regarded as partially answered. On the whole, these accounts present evidence of quiet progress and unruffled prosperity, which is precisely what shareholders like best to see. The district which the undertaking supplies is rapidly becoming more populous; but there is yet a wide belt of open country to be filled up with streets and houses before the expansion of the South Metropolitan Company's business can receive a check.

SALFORD AGAIN.

Gas matters continue to bulk largely before the eyes of the people of Salford. It is first the turn of Mr. Ellis Lever—"guardian angel" of the gas consumers and ratepayers of two or three favoured towns, of which, need it be said, Salford is chief—who frets and fumes for months over wrongs which arouse his righteous indignation, but, nevertheless, evades all the attempts of the Corporation to meet his repeated demands for an investigation, and in the end evacuates the position in which he has entrenched himself. Then the stokers have an opportunity of making things disagreeable; and the settlement of the dispute with them leaves a rankling sense of wrong, which still continues at the end of many months. After this, there comes an organized and persistent attack upon the quality of the gas which is being supplied—an attack in which various Local Boards, the Guardians of the Poor, and even the School Board (which is solicitous for the eyesight of the children) join their forces. And then, lastly, there is a proposal by the Gas Committee to increase the salary of Mr. S. Y. Shoubridge, the Engineer and Manager of the works, which arouses the strongest opposition, and, after a debate characterized by the intensely bitter feeling which is infused into all references to Salford gas questions, ends in the adoption of the resolution by the smallest possible majority. Sensible people in Salford must surely be getting weary of this eternal harping upon one string. Gas must be to them as tiresome a subject as Ireland is to men who are not professional politicians; and they must wonder whether there are no other local interests worthy of attention. The discussion on the question of advancing Mr. Shoubridge's salary was as instructive as such debates are wont to be. It afforded a not unusual exhibition of the narrow-minded view which the municipal conductors of gas undertakings are apt to take. On all hands it was admitted that the new Manager has done well. There has been a substantial reduction in the price of gas during the year; but, even when £12,000 is allowed for the diminution of revenue which this represents, the results of the financial year now drawing to a close will show an increased profit of £2000 over last year. Such reforms have been effected in the conduct of the works that, while the quantity of gas made shows a considerable increase, the number of men employed is thirty less than was the case twelve months ago; and a saving equal to £1500 per annum has thus been effected. Mr. Shoubridge has indeed grappled most successfully so far with a really trying and difficult situation. The Gas Committee, who were practically unanimous in recommending the increase of his salary, are not the old Gas Committee of the Hunter *régime*. They are the men who were entrusted by the Council with the duty of introducing a new and better government of the undertaking; and the testimony in their name that Mr. Shoubridge has been successful beyond their anticipations, is no small commendation. They are to be congratulated on having carried their proposal in the teeth of a most determined opposition. To Mr. Shoubridge the advance would no doubt have been more acceptable if it had been given less grudgingly; but he may, perhaps, console himself with the reflection that niggardliness is inevitable so long as men are—to quote one of the members of the Salford Corporation—"in the habit of measuring a big "man's worth by their own smallness."

THE SOUTH METROPOLITAN GAS COMPANY FINED FOR DEFICIENT ILLUMINATING POWER.

The remarks of Colonel Makins, M.P., and Mr. George Livesey at the recent meeting of The Gaslight and Coke Company, upon the subject of the testing of London gas, receive a fitting commentary in the police court proceedings, reported in another column, in which the South Metropolitan Gas Company figured as defendants, and were fined four half-sovereigns in all for deficiencies of illuminating power. The proceedings at the Southwark Police Court are very instructive; and if anybody rises from perusing our report with any other opinion than that the whole system is farcical, he must have a strange way of appreciating evidence. The only thing that appears to be clearly shown by this case is that more than a change of the parliamentary standard is required to put the testing of Metropolitan gas upon a sensible footing. The whole arrangement—standard, procedure, supposed safeguards—is unsatisfactory in the extreme. We have every respect for Professor Williamson, the Chief Gas Examiner; but it cannot be truly said that on this occasion he did much to justify his existence. His idea of what constitutes a proper hearing of an appeal by a Gas Company against a condemnatory report by a Gas Examiner is peculiar, as shown by Mr. Besley, for the Company. The proceedings at the Court can hardly be described. The Metropolitan Board of Works, who were the prosecutors, protested against anything like going into the merits of the matter by the Magistrate; contending that the Court could only enforce the penalty stated in the Act, and could not go behind the Chief Examiner's report. On the other hand, Mr. Besley did his best to upset the reports, and expose the loose way in which the Act is carried out. This line of defence makes the proceedings read like a scandal to the Board of Works and their officials. Everything is made to appear wrong—candles, photometers, examiners, and, in short, the whole system from top to bottom. It will be fairer to the persons implicated in this exposure to throw most of the blame upon the process which they are expected to apply. Gas examiners have to measure the illuminating power of gas by an unreliable standard; and to employ instrumental aids which are continually being altered. It is apparently a most difficult thing to fit up testing-stations in a way to give satisfaction to all parties, and so that the work for which they are designed shall be performed in a reliable manner. There can be no question that the personality of the examiner is a very important element in the matter. We believe the Metropolitan Gas Examiners working under Mr. W. J. Dibdin, F.C.S., and having Dr. Williamson for their Jupiter, to be an upright, honourable body of gentlemen, incapable of violating their trust. An examiner may, however, take an erroneous view of his position. He may be fussy, and disposed to think that his mental attitude with regard to the Gas Company must be necessarily antagonistic, and that it is incumbent on him to occasionally make trouble in order to manifest his watchfulness. The Metropolitan Board have done much in the past to encourage this manner of thinking, by their own carping method of treating the Gas Companies as great sinners too artful to be found out except by the constant exercise of extreme cunning. It is to be hoped that the County Council will proceed on a broader principle. Constant and reliable public testing is capable of being very helpful to a Gas Company, by keeping their officers up to the mark, and showing them what they are doing. Testing which is a parody on the real thing, however—which makes gas sent out in the same condition from the same coals for days and weeks together appear to jump up and down one or two candles a day without reason—such testing is a great nuisance, as it perplexes the gas makers, deceives the public, and does not serve a useful purpose to anybody. By the way, do the Metropolitan gas examiners ever shift their places? If not (and we do not think they are ever changed), it might not be a bad idea for one of them—the most experienced and reliable man that could be selected for the purpose—to be made peripatetic inspector of all the stations, with orders to make a test in a different station every day. All the Gas Companies ask for is fair play. They are desirous of fulfilling their obligations to the public; but they have a right to be protected against such miscarriages of justice as are inevitable with the present system of carrying out the law.

MR. SLATER ON ARTIFICIAL ILLUMINATION.

The paper by Mr. John Slater, F.R.I.B.A., on "Artificial "Illumination," an abstract of which was published in last week's Journal, was highly applauded by the auditory, the members of the Architectural Association. It does not contain anything very new or striking to gas engineers, who are familiar with the matters dealt with by the writer; but it was regarded as very instructive by the architects for whom it was written, most of whom, unfortunately, know very little indeed about gas lighting. We had occasion recently to notice that the Editor of the *Builder* had recommended architectural students to make themselves acquainted with the principles of electric lighting, in regard to which we remarked that, if this advice is followed, architects will know more

about electric lighting, the rarest of artificial illuminants, than they do about gas, which is the commonest. To judge from the general tone of the discussion on Mr. Slater's paper, some of his hearers learnt from it for the first time that there is any art in the application of gas for lighting. They seem to have entertained the impression that a gas-burner is a gas-burner, and there an end. Mr. Slater astonished them with what he had to say about the varieties of gas-lamps and their qualifications. It is greatly to be deplored that so many architects are imbued so thoroughly with reverence for the old masters of their craft that they cannot strike out a new line to satisfy modern conditions. Gas was unknown to the old architects; and consequently their modern followers cannot treat a gas-lamp intelligently. All modern lamps that have any pretensions to tastefulness are reproductions of old forms, some of which are not adapted for gas. Wherefore architects of the *dilettante* type cry, "Away with it—it "is a foul thing!" Gas has a bad name with architects, who will never have anything to do with it if they can avoid it. For places of business, they cannot help themselves; but how many architects and decorative artists have ever tried what they could do to improve gas-fittings for interiors? Most of the attempts of the kind that have from time to time been shown to us as examples of architectural treatment of gas-fixtures, are hideous outrages upon all the scientific rules of artificial lighting. As to their artistic merit, this being a question of taste we cannot say anything about it. In a general way, however, it is acknowledged by themselves that architects have a great deal to learn about modern gas-lamps and the way to use them. Without disputing the educational value of the work of making measured drawings of old buildings, which young architects are encouraged to undertake upon all possible occasions, we venture to suggest that even students of an older growth would do well to look in sometimes for half an hour at a good gas-fittings and lamp maker's, with a view to keeping themselves posted in the best developments of a means of lighting which must be employed in all but a small percentage of modern town buildings.

THE SOUTHERN DISTRICT MEETING.

The Southern District Association of Gas Engineers and Managers held their annual meeting last Thursday, at their comfortable new quarters, the Hôtel Métropole. Mr. John Somerville, the President, occupied the chair and read his Inaugural Address, which will be found in another column. Recent inclement weather was against a full attendance; but the gathering was a very pleasant one. The Honorary Secretary (Mr. J. W. Helps, of Croydon) read the report of the Committee, which shows the society to be in a flourishing condition both as regards membership and funds. The address was very well received, as it fully deserved to be, containing as it does a great deal of interesting and instructive matter. Few gas engineers have a more varied experience than Mr. Somerville; and he is always ready to place his knowledge at the disposal of his professional brethren. As customary at the first meeting in the year, the proceedings concluded with a dinner, which was followed by a few toasts. That an English Association of Gas Managers should meet at an hotel with a French name, and transact their business and enjoy themselves by the light of electric lamps, is a striking illustration of the eclecticism of the age. Much amusement was caused by the vagaries of the electric light, which, as usual, was not constant for many minutes together; its vacillations being particularly noticeable while the President was reading his address—affording him many opportunities of introducing a "gag" which would have been relished by his audience. To his credit be it spoken, however, Mr. Somerville resisted the temptation. The Southern is one of the most successful of the District Associations; and its meetings are always very enjoyable,

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Issue of Boston (U.S.A.) Gas Bonds.—By an advertisement which appears elsewhere, our readers will see that the Bay State Gas Company of New Jersey are inviting subscriptions for $7,000,000 (£1,400,000) 5 per cent. sinking-fund trust bonds; being part of the total of $12,000,000 authorized to be issued by the Company. These bonds are created for carrying out the purchase by the Company of the fourteen gas undertakings enumerated in the prospectus (which comprise the total gas business of the city of Boston); and they constitute a first charge on the stocks deposited for this purpose with the Mercantile Trust Company of New York. The bonds will be issued at the price of £98 per bond of $500; and the principal will be redeemable in gold, at par, on Jan. 1, 1939. The subscription list will close on Friday next.

Essays, Commentaries, and Reviews.

THE AFFAIRS OF THE GAS INSTITUTE.

The process of enrolling members of the Provisional Committee of the new organization has gone on satisfactorily during the past week. Upwards of a hundred names have been received; and its success is now assured, not only from the number of adherents, but also from their quality. It is likely that the first list of names will be published next week. It was fully intended to give the names this week; but fresh adhesions coming in, publication has been postponed.

It will be seen from the following correspondence, that Mr. Thomas Newbigging, who was abroad during the critical period embracing Mr. Henry Woodall's retirement and the incubation of the new movement, favours a waiting policy:

Manchester, Feb. 15, 1889.

Sir,—During the last few days, I have received many letters from members of The Gas Institute asking what steps I purpose taking under present circumstances, and requesting my advice as to the best course to be pursued.

From the enclosed correspondence (if you will be good enough to insert it), my view of the situation may be gathered; and my advice to my fellow-members of the Institute is to wait patiently till the policy of the Council has been public announced, which, as I presume, will be at the annual meeting in June next.

Thos. Newbigging.

[Enclosure.]

Leicester, Feb. 13, 1889.

Thomas Newbigging, Esq., Manchester.

Dear Sir,—In looking over the list of names of those to whom my circular with reference to a new Gas Association was sent on Friday week last, I notice that you are one of the few more prominent Engineers who have not replied thereto.

Up to the present, I am pleased to say that no less than 90 have joined the Committee; and this number includes, with but few exceptions, the names of the most prominent Gas Engineers in the country.

It will be much appreciated, if you will allow your name to be added to the Committee.

Trusting that I shall receive from you a favourable reply,

I am, dear Sir, yours faithfully,

Alfred Colson, Hon. Sec.

Manchester, Feb. 15, 1889.

Alfred Colson, Esq., Leicester.

Dear Sir,—I am duly in receipt of your letter of the 13th inst., the contents of which I note. Your circular of Jan. 31 came to hand before my return from South Africa.

I entirely agree with the proposition, "That a National and Representative Organization is desirable;" but I cannot but think that the present movement is premature. It would, in my opinion, have been much better—and indeed only fair and decent—to have awaited the outcome of the deliberations of the Council of The Gas Institute, and the result of the next general meeting's proceedings, before taking action in the direction of forming a new organisation.

Perhaps the remnant of Council left in The Gas Institute is not fairly representative of the gas industry; but that is not its fault, if it is not. The members of Council composing such remnant were chosen, along with the others who have retired, by the general body of the members of the Institute; and to that extent they are representative. Furthermore, it is not impossible that they may discover a way out of the present deadlock, whereby the representative character of the Institute (if it has lost its representative character) may be restored.

At any rate, I shall wait and see; and if that result is found to be impossible of accomplishment, no one will be more anxious than myself to see the formation of a new organization.

I am, dear Sir, yours faithfully, Thos. Newbigging.

Bearing in mind the part played by Mr. Newbigging throughout the protracted disturbances which have culminated in the present development, it cannot but be regretted that he did not return home soon enough to join his old colleagues in the informal conference at which the policy which he recommends, although preferred at the outset by nearly every one, was examined and found impracticable. We cannot help thinking that if he had had this opportunity of arguing the question with those whose regard for the Institute was not less than his own, he might have come to a different conclusion. We, however, respect him for his declaration of what he believes to be right, especially as his present attitude helps to dispel the silly idea which has been industriously promulgated by Mr. George Bray and his friends, that the old leaders of the Institute were a "clique," governed by one influence, which crushed out individual action. It is intelligible also that, as one of the founders of The Gas Institute, Mr. Newbigging should be specially loth to do or advise anything which might be regarded as antagonistic to it. With all this, we venture to maintain that Mr. Newbigging's view of the case is erroneous, and his well-intentioned advice mischievous and futile. Mr. Newbigging's policy, like that of all others who hope for any valid reconstruction of the Institute, by the hands of the present Council or otherwise, at the June meeting or any other time, is vitiated by a really fundamental misunderstanding. The former Council resigned because they could not expel Mr. Bray. It is true that the actual voting was muddled; but had it been legally taken under the rules, the policy of the Council failed, although supported by many members, and they had no alternative but retirement. Their resignation was the signal for that of others; thus causing the Institute to lose its representative character.

It is not a question of the absence of this or that prominent

man, but of wholesale defection, involving men recognized by the Institute on many occasions, and understood by the world, as representative leaders of the industry. This party could not belong to any organization which held Mr. Bray; but there was nothing to prevent the formation of another society of the kind, in which they could rejoin their old colleagues, and from which Mr. Bray *et hoc genus omne* might be excluded. Mr. Bray is immoveable from the Institute. He has obtained from the Court a perpetual injunction which forbids anything construable into an attempt, direct or indirect, to deprive him, without his own consent, of his full rights and privileges as a member of the Institute. What prospect is there of the Council or anybody else devising a policy that shall overcome this obstacle, and restore the representative character of the Institute, if we wait not merely until June, but even until Doomsday? Mr. Newbigging says, "Wait and see;" but we challenge him to formulate, as if he were President himself, any such policy as he expects from the remnant Council. He knows who constitute this remnant; and we ask him what reason he has for hoping that they—as a whole or individually—will be able to propound a way out of a deadlock that has been forged as tightly as the law can make it. If he has nothing more than a vague, shadowy hope of "something turning up" to support him, then we say that Mr. Newbigging is not justified in offering his advice to wait. If he has any proper justification, it is his duty to produce it. We believe the members of the Council by this time realize that the only programme they have yet put forward—and which we assume Mr. Newbigging to have seen—is futile, and that dissolution is the only way open to the Institute. But this is precisely what the late members of Council have seen and acted upon, and is the policy in which we have supported them from the first, as we shall do to the end. Every other road is blocked by Mr. Bray; and in shirking the only means of escape, the present Council—against their wishes, we believe—find themselves constrained to accept Mr. Bray's company, and play his game. Why, if they recognize the inevitable, do they not act upon it? Then there would be nothing to prevent their joining the Provisional Committee; arranging for the first meeting of the new organization in June, to be preceded by a formal meeting for declaring the dissolution of the old Institute. Why cannot this agreement be concluded now, before any publication of the names of the Provisional Committee? What is it that prevents such a desirable healing up of the division? Nothing, apparently, but a misunderstanding, which Mr. Newbigging himself would be the first to wish removed.

We most willingly publish his letters, but would appeal to him to consider during the week the prospects for the discovery by June of such a policy as he appears to desire, and to write again. If other people have decided not to wait for the Council to say what they think of doing in June, it is not out of disrespect for their credentials or disregard for the Institute, but because of the futility of their only declared programme. It is idle to wait until June for the purpose of expressing opinion upon a policy that was formulated in January. If the Council and the President had hung together until June, and then left the members in general meeting to choose between two policies, they would probably only have led the Institute from one trouble into another, through the absence of all legal facilities for carrying into effect a resolution to dissolve and reconstitute. This is another point which Mr. Newbigging may not have fully appreciated. It is worth his attention, however. We mention these points in order to show him and others that the decision to abandon the old Institute to its fate, and start afresh, has not been made hurriedly and without ample reason. In fact, it is for those who decide differently to justify themselves, which none of them has attempted to do. It is the present Council's own fault that they have lost the lead in this matter. They propounded in January a programme comprising eight points, the last and chief of which was barred by Mr. Bray's injunction, and therefore impossible; the first superfluous; and the rest comparatively questions of detail. Will Mr. Newbigging favour us with his opinion of this programme—the only authorized one, be it remembered—and inform us if it affords sufficient ground for the advice to "wait and see" what will come of debating it in June? We have not the slightest objection to wait until June, or June twelvemonth, if any good is to come of it; but object to waste time following up an obvious "no thoroughfare."

Sulphate Making in Victoria.—Last year we noticed that the manufacture of sulphate of ammonia was being extended at Melbourne, and that Messrs. R. and J. Dempster, of Manchester, had sent one of their patent stills to the Melbourne Gas Company. We learn that this has worked so satisfactorily that the Company have had two more of these appliances sent out by the same firm.

The Halifax Gas Scandal.—As some misunderstanding appears to have been caused by the mention of Alderman Riley's name in connection with the recent proceedings of the Halifax Town Council in Committee, in reference to the fresh communications made to them on the subject of certain commissions stated to have been paid to the former Gas Manager, Mr. W. Carr, as reported in the Journal last week on the authority of the *Bradford Observer*, the Halifax Correspondent of our contemporary has written to that paper to explain that the expression by the Councillors of their opinion that legal proceedings ought to be taken by Alderman Riley to clear himself from the charges brought against him had no connection whatever with the communications which had been under consideration.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 354.)

The Stock Exchange markets opened last week, as a rule, rather dull and heavy; the bad weather at home, and all sorts of rumours abroad, having a depressing effect. They for the most part recovered, however, in some degree as the week went on. The Money Market shows no change or feature to speak of. The Gas department, however, has been interesting. The issue of the report and accounts of the South Metropolitan Gas Company has caused a further advance in all their issues, in view of an increase of ¼ per cent. in the rate of dividend. The "A" has risen to 323-328—the highest figures it has ever reached; and it will probably go higher when the fact is realized that the dividend to be declared to-morrow upon it will practically be at the rate of 16½ per cent., or an increase of ¾ per cent. upon the last rate declared. This is the effect of the provision for apportionment of dividends under the Scheme by which the Phœnix Company (now represented by the "B" stock) was amalgamated. In accordance with this, "B" will receive 12⅝, while "C" is entitled to the rate declared—unaffected by any modification. Gaslight "A" has been fairly active all the week, with great firmness; and there has been considerable dealing in the debenture, preferential, and maximum issues. All the stocks which were quoted *ex div.* on Thursday show an advance in price. Commercials show no change, except an advance in the debenture; but there is practically nothing doing in them, as there appears to be no stock in the market. Suburban and Provincial Companies have been very quiet, and the only change is a slight advance in Brentfords upon *ex div.* correction. Foreign undertakings also have been considerably quieter, and remain unchanged. In our List of last week the corrections to the prices of European old and new were, by an accident, carried to Continental Union. We hope the error was too obvious to be misleading. There was more than the usual average of business done in Water during the earlier portion of the week, coupled with great firmness; and the noteworthy advances of 6 in New River, and 4 in East London, have been made. Kent shows no rise upon *ex div.* adjustment; and still, for some mysterious reason, it figures as the cheapest water stock in the market, while it ought, on its merits, to be nearer the other extreme.

The daily operations were: Very fair business in Gas on Monday; especially in various Gaslight secured issues. Water was in demand, and East London rose 2. Tuesday's Gas business was more among the Foreign division. Gaslight "A," though quieter, looked like rising; but the only move was an advance of 2 in Commercial debenture. In Water, East London showed increasing strength. On Wednesday Gas transactions were extremely limited; but Gaslight "A" rose 1. Water was good; and East London and Grand Junction advanced 1 each. Thursday brought renewed activity in Gas—especially Gaslight "A." The advances effected by Gaslight and Brentford issues upon *ex div.* adjustment will be found in the list at page 354. In South Metropolitans, the "A" rose 2; "B," 1; and "C," 5. Business in the "A" was done at 325. In Water, New River rose 6; and was done at 351 *ex div.* Gas continued active on Friday, without further change. Water was quiet and unchanged. There was more business than usual done in Gas on Saturday; and South Metropolitan "A" and "B" made a further improvement of 1 each. In Water, the only feature was an advance of 1 more in East London.

ELECTRIC LIGHTING MEMORANDA.

RETURN TO GAS AT LEAMINGTON—FINANCIAL PROPOSALS OF THE LONDON ELECTRIC SUPPLY CORPORATION—THE EDISON CHEMICAL METER—THE DISTRICTING OF KENSINGTON.

In another column will be found a report of the latest development of the lighting question at Leamington. A meeting of the Town Council has been held at which the Town Clerk read the letter of the Board of Trade respecting the unauthorized breaking up of streets by electric light speculators, to which reference has been recently made in this column. This official communication was rightly regarded as bearing seriously upon the position of Messrs. Chamberlain and Hookham, who have broken up some of the Leamington streets with the connivance of the Local Authority. It was referred to the General Purposes Committee. After this came the consideration of a letter from the electric lighting contractors, offering to determine their agreement for the street lighting at an earlier date than that which has been notified to them by the Council; the terms in which the communication was couched being significant of the strained relations existing between the once favoured electricians and their patrons. After some discussion, it was decided that the Parade and such other parts of the borough streets as may be selected by the Town Council shall henceforth be lighted by improved large gas-lamps, which, it was stated, could be done to very much better purpose than by electricity, and at considerably less than half the cost. This, therefore, is the fruit of the Leamington electric lighting experiment. The same public authority which fell out with the Gas Company over their charge for ordinary street gas-lamps at £2 2s. per annum are now anxious to pay £3 14s. 9d. each for very much more powerful lamps. The triumph of gas could not have been more complete. Once again the electricians, by creating a taste for more light than existed in the public mind when the only alternative to gas was a feeble and dirty oil-lamp, have proved themselves benefactors to the gas interest as well as to the community at large.

The London Electric Supply Corporation are making a great

experiment upon the investing public, by offering for subscription £250,000 of 6 per cent. preference capital. This Company, who have succeeded to the Grosvenor Gallery electric lighting concern, have a capital of £1,250,000, of which £555,000 has been issued in ordinary shares, with £418,000 paid up. The money is required for the Company's celebrated Deptford station, now in course of equipment. The station is expected to be able to supply 850,000 lamps; and the prospectus of the new issue states that at the present moment machinery for 250,000 lamps is being erected, "a portion of which will be in operation in the course of the next three months." Upon the same authority, we learn that the computed revenue from this plant will be "at least" £160,000 per annum, the profit on which is expected to be not less than £60,000, upon which the preference interest, amounting to £15,000 per annum, will be a first charge. The subscription list is to be closed to-day. This is the venture of which an American critic remarked that it would be likely to prove either a gigantic success or a stupendous failure; allowing it to be inferred that he thought the probability was on the side of the latter result. It remains to be seen whether the investing public care to face the risk; and then to wait for the consequences. The Directors make great play with the success of the very limited Grosvenor Gallery experiment; but omit to acknowledge that the enlarged venture will have to be made under novel and untried conditions, besides being subject to statutory obligations.

The *Electrical Review* has published a long statement, by Mr. W. J. Jenks, entitled "Six Years' Practical Experience with the Edison Chemical Meter," which is interesting at the present moment, when the problem of supplying electric light by meter is before the world. It is stated that a circular was recently addressed to the managers of the 26 Edison lighting stations now at work in the United States, to which 23 replies had been received. In 17 cases meters had been used from the commencement, and the meter system was generally declared to be preferable to any other method of doing business. It is true that most of the replies dealt with the abstract question of the desirability of selling by meter instead of by contract; but this is a matter that has been settled by gas companies' experience. There is sufficient consensus of opinion among the persons addressed, however, to show that both they and their customers are fairly pleased with the Edison meter. The report of the Manager of the New York Edison Lighting Company (which is stated to be supplying 15,000 lamps and 150-horse power in Sprague motors to 647 customers) is to the effect that these meters do not vary more than 2 per cent. in registration. Altogether, there are said to be 83,856 lamps out of a total of 117,501 lamps, in 23 stations, served on the meter system; and where the meter is used, the stations are reported to be mostly earning a profit. The Electric Light Association of the United States have passed a resolution approving of the Edison meter, and declaring it to be not too expensive in application for stations supplying 1000 lights and upwards.

The Vestry of Kensington have at last made up their minds respecting the course they will adopt with regard to the various electric light speculators who have been threatening to overrun the parish, and treat the public to a repetition of the state of things that prevailed in the pre-districting days of the gas companies. Public favour was asked by six rival companies, between whose conflicting claims the Vestry was reduced almost to despair. Driven to "do something," however, by the pressure of public opinion, the Vestry appointed a Committee, who, after several abortive attempts, have succeeded in formulating a policy for dealing with the electricians, which has been adopted by the Vestry and will be laid before the Board of Trade. The fundamental point of this policy is to assign distinct, but coterminous, districts to the various applicants, with the understanding that they shall not be disturbed by fear of competition so long as they discharge their obligations to the public; while in the event of a failure in any district, the area should be reassigned to the more deserving of the neighbouring companies. This appears to be the gist of the settlement, which is, however, complicated by the prescription of a variety of details that may occasion trouble if insisted upon. On the whole, however, the recommendations of the Vestry Committee are reasonable, and have been accepted as fairly satisfactory by the representatives of the companies interested. If these latter mean business, therefore, there should be no valid reason why the economical problem of electric lighting should not be fully solved in the limits of the parish of Kensington by the six companies who are to be permitted, subject to the approval of the Board of Trade, to try what they can do in their respective districts. The competition should certainly, therefore, be keen enough among such close neighbours.

We have received from Messrs. E. and F. N. Spon a copy of "Notes on Water Supply in New Countries," by Mr. T. W. Stone, Assoc.M.Inst.C.E.; and from Messrs. Crosby Lockwood and Son, a book entitled "Plumbing, House Drainage, and Ventilation," by Mr. W. P. Buchan.

At the meeting of the Carlisle Town Council last Tuesday, the salary of the Gas and Water Engineer (Mr. J. Hepworth, Assoc. M. Inst. C.E.) was increased by £100 per annum. The Chairman of the Gas and Water Committee (Mr. Forster) and the Mayor (Mr. J. R. Creighton) referred in terms of high praise to Mr. Hepworth's labours in connection with the two important undertakings under his management, and to the great success which had attended them.

THE SYDNEY GASHOLDER.

The series of plates and descriptive articles, relating to the gasholder recently supplied by Messrs. C. and W. Walker to the Australian Gaslight Company, which have lately appeared in the Journal has, we doubt not, been fully appreciated by our readers. It is perhaps advisable, now that the series is completed, that we should make some comment upon the observations, some of which are of a distinctly argumentative character, wherewith Messrs. Walker supported the particular design adopted by them for this work. It is, of course, understood that the articles in question merely set forth the makers' views, and no more involve us in responsibility for them than do any other technical communications which we publish from week to week upon the authority of the authors' names. Our only responsibility in these cases is the general one for the quality of the matter. We knew the character of the Donnington firm well enough to be confident that anything in the way of structural ironwork coming from them would be worthy of being cited as an example of contemporary workmanship; and we had heard that they had taken special pains with the Sydney holder. Hence our willingness to place our pages at the disposal of Messrs. Walker to the extent required for the full description and explanation of this important production; and we have to acknowledge the readiness with which the firm complied with our desire that the explanation should be as full as possible, and should so far embrace principles as to make the record valuable for reference as a memoir upon this particular class of work. It is impossible for any student of gas engineering to peruse with due attention these copious and candid articles without feeling as though he had assisted at the design and construction of a first-class piece of gasholder work, and had secured a number of valuable memoranda upon a variety of points which would surely be useful to him in after years. A full description such as this of the Sydney holder is the next best thing to experience in the makers' yard and on the scene of erection.

Having made these acknowledgments to Messrs. Walker, we shall proceed with our own observations upon their statements. In the first place, we must emphatically record our agreement with Mr. Livesey's remarks upon the policy of going to gasholder builders for designs as well as for the making of these structures. In the first article, Messrs. Walker beg this question by stating that "it is, of course, obvious" that manufacturing firms like themselves "who are constantly making and erecting gasholders, not only from their own designs but from designs by all the most eminent gas engineers of the day, must be in an advantageous position for determining the most economical and effective design to fulfil given conditions. So many gasholders pass through their hands that they can tell at once the best form to adopt to attain the maximum of stability with the minimum of work for the given capacity." We took note of this claim at the time it was made; and now the opportunity has arrived for stating the other side of the question. Messrs. Walker's argument would apply with equal force to the case of a druggist and dispenser of physicians' prescriptions, or to a builder accustomed to work under the best architects, as to the case in point. What they mean is, possibly, that they keep designers as well as constructors, and can be trusted to do both divisions of the work equally well. This is a matter respecting which opinions differ. If it is conceded that gasholders are to repeat each other, like hats, with only some slight differences of pattern, sufficient to mark the changes of fashion from year to year, then, of course, there is no need for the designer; and the man who makes most holders must be credited with knowing most about them. If, however, every proposed gasholder is to be a work thought out with regard to its circumstances, the designer cannot be dispensed with. The type, material, proportions, and details of the construction of the work must be settled by somebody; and the question then arises whether this person should be in the employment of the maker or the buyer of the holder. The designing of a gasholder, as of any other piece of work, costs something. Plans must be drawn and specifications written; and there is generally something to be thought out, and some choice to be made between alternative courses, even in the simplest job. The purchaser must pay for this in the shape of an engineer's commission, or in some less obvious way when he buys the work right out of the maker. The fact of the maker supplying the design no more suppresses the designer than the circumstance of many a surgeon making up his own prescription abolishes the professional character of his advice. Unless we are to go even further, and argue that architects are superfluous because of the abundance and skill of builders, we cannot dispense with the engineer in gasholder work. And this consideration brings us back to the question already stated, as to whether the inevitable engineer shall be directly responsible at first hand to the purchaser, who really pays him in the end, or whether his immediate motives shall be supplied by the contractor. The alternative only needs to be stated to point to the only tenable choice.

It will be observed that the argument so far assumes that for all practical purposes it is immaterial, except as a matter of policy, whether the engineer whom we have shown to be indispensable, is in the employ of the contractor or the purchaser. This is, however, true only to a very limited extent, and for comparatively routine work. As Mr. Livesey has shown, a contractor's engineer, however skilful, is necessarily trammelled by the force of "use and wont," which it is the lifelong effort of men of progressive genius to overcome. In his weighty protest against the attmepts to reduce the status of engineers, which are among the most objectionable features of this age of prosperity in gas supply,

that appeared in the JOURNAL for Dec. 18 last (p. 1071), Mr. Livesey said: "It is an undoubted fact that the great advances made in gasholder design and construction are not due to contractors. Had we depended upon them, very few (if any), improvements would have been made. They would have followed the old lines, and properly so; because it would not have been wise on their part to have introduced innovations on established practice." To clinch this argument, we may ask what would now have been the condition of the art of gasholder design, if none of the original-minded engineers who have worked in this department during the last quarter of a century had endeavoured to improve upon the old models? Most if not all the new departures which have made this branch of engineering construction so interesting, have involved the acceptance of risks which no contractor would have been justified in undertaking. The best proof of this is supplied by Messrs. Walker themselves. They cannot claim any originality for their Sydney design. More, a critic disposed to be severe might say that they admit making use of their advantages as contractors to "pick the brains" of the engineers whose work passes through their hands. We do not say this, however, because plans are not patented, and "imitation is the sincerest form of flattery." To advance the possibility of imitation as a reason for dispensing with the original for any future use is, to say the least, to fix the clock at a certain hour irrespective of the time of day.

Without pursuing this argument further, we will return to Messrs. Walker's remarks. The observation as to the desirability of employing common sections of bar iron or steel, and restricting their variety in any single structure, is thoroughly sound. We go further, as expounded in a previous article, and argue for the observance of type wherever the principle can be held to apply. Nature is our best exemplar in regard to creation. With all her infinite variety, to meet diverse conditions, she is faithful to types. Man can improve upon natural processes in a sense, however, and can often arrive at a desired end by striking out a new type where Nature would work out the object through complicated modifications. It is not our intention to follow Messrs. Walker's plans in detail for the purpose of drawing attention to points where differences of practice might be followed by different engineers. There are doubtless many of such points; but to dwell upon them would only arouse controversies which might in many cases be resolved into questions of opinion scarcely to be distinguished from individual taste. There is, however, much to be said upon some of the arrangements preferred by Messrs. Walker, which rests on rather more solid ground than mere opinion; and the use of channel irons for cups and grips, instead of Piggott's bent plates, is one case which may be mentioned. In their description they treat these members as ring girders only, but it must not be forgotten that the cups have to hold water as well; and we have no hesitation in saying that there is less liability to leakage, if only from the fact of their being fewer rivets and joints under water, in the bent cup than in that built up of channel iron. And as to strength, of which Messrs. Walker make a great point, it has yet to be shown that any holder made with bent cups has suffered in this respect. We agree with the statement as to the undesirability of breaking joint with the side sheeting, which is never strained sufficiently to make broken joints worth their trouble. It is different with the crown sheeting, which has a fair tensile strain to bear. The device of making the dome always a segment of a sphere is convenient; and the thickening of the outer rings of sheeting for practical considerations arising out of the riveting, as stated by Messrs. Walker, may also take up the extra strain in this part, which Mr. Livesey, in his largest holders, has provided for by increasing the curvature. Not all engineers, however, agree with dividing the side sheeting into bays, by riveting the sheeting to the vertical stays. Some prefer to allow the whole side sheeting to hang free all the way round. With regard to the standards, without discussing them and the girders and guides (except to agree, in regard to the last, that channel iron would have been preferable) in detail, it may be asked why, if these were considered necessary, they were not carried out in the form of Paddon's ties; or at least, why the rod did not always take the outside of the standards. Wire rope is sometimes preferred to rods for this purpose.

These are a few of the comments that may be fairly passed upon Messrs. Walker's holder; and they are offered, it should scarcely be necessary to say, without the smallest desire to detract from the merit due to them as contractors for turning out a very creditable piece of work, calculated to give every satisfaction to the purchasers. In conclusion, we have only to repeat that, while this Sydney gasholder probably represents the highest effort of an experienced firm of contractors, and is worthy of being referred to as an example of good contemporary practice in the department of gas engineering construction to which it belongs, it has no claims to special regard for originality. It merely "marks time," so to speak, as an adaptation of successful engineers' designs, but does nothing to support the claim that the engineers whose realized ideas it embodies have said their last word on this branch of their professional cares, and may abdicate in favour of contractors.

AT the meeting of the Salford Town Council last Wednesday, an adjourned discussion took place on a proposition of the Gas Committee to increase the salary of the Gas Engineer and Manager (Mr. S. Y. Shoubridge) by £100 per annum. Considerable opposition was raised to the advance; an opinion being expressed that Mr. Shoubridge had not been in the service of the Corporation a sufficient length of time to justify it. Eventually the proposition was carried by the casting vote of the Mayor.

THE SUPPLY OF WATER BY METER.

A CONSIDERABLE period has elapsed since we discussed editorially the important question of the incidence of charges for water supply. In the early part of last year, some prominence was given to the subject; and, apart from our editorial comments, communications were published from several correspondents whose views, though divergent, were of an extremely interesting character. The principal advocate of "water by measure" stated his case more than once, and always with much force. On the other hand, practical objections to a universal system of supply by meter were advanced by writers whose arguments went far to destroy the position of the other side. The "meterites"—to coin a short and convenient name—again returned to the charge, in our "Correspondence" columns, towards the end of the year. They continue to hurl themselves against the phalanx of Companies and Corporations who seem now, no less than formerly, to prefer the method of payment by rates and not by measure. Possession, in this as in other cases, is nine points of the law. The Companies already have their own method well established, answering satisfactorily; and the public, despite the efforts made to rouse them to discontent, do not show any general disposition to demand a change. In these circumstances the meterites have an uphill battle to fight; and it is reasonable to suppose that a conviction of the abstract advantages of the meter system would be insufficient to sustain them in their self-imposed contest, were it not for a profound conviction of the value of some meter or meters of a special kind and make. What may happen in the dim and distant course of the future, it is impossible to say. But at present, certainly, there are no signs of a revolution in the system of water supply for domestic purposes.

The legal position of the Water Companies has always been perfectly clear and intelligible. After full deliberation, the Legislature fixed the terms on which the Companies might sell water to the public. It was not thought necessary or fair to force them to adopt a meter system for domestic purposes; the law left that method of charging to be resorted to if both parties to the bargain are content to adopt it, but not otherwise. Of course, instances have not been wanting in which captious consumers have endeavoured to blow first hot and then cold on the law relating to water supply. A notable example of this kind occurred recently in the Court of Appeal; and the decision of the Master of the Rolls and Lords Justices Bowen and Fry (reported in last week's issue of the JOURNAL, p. 295) affords an opportune illustration of the mutual rights of the public and the Water Companies. In that case the defendant, Mr. Dickenson, built a block of model lodging-houses; and the Southwark and Vauxhall Water Company agreed, at his request, to supply the occupants of the building with water by meter, in consideration of a payment at the rate of 1s. per 1000 gallons. This agreement, though it was deliberately entered into and fulfilled to the letter by the Company, Mr. Dickenson afterwards sought to repudiate, on the ground that it was *ultra vires*, because, forsooth the Company under their Special Act of 1852 were authorized, in the case of an ordinary meter supply, to charge only 6d. per 1000 gallons when the quarterly consumption of water exceeded 200,000 gallons. The defendant's tenants used more than 200,000 gallons per quarter; therefore, said Mr. Dickenson, the agreement notwithstanding, he was not liable to pay more than the sixpenny rate for the quantity consumed. Of the morality of this contention we may leave our readers to judge. Upon its value from a legal point of view both Justice Cave and the Court of Appeal have pronounced in sufficiently explicit terms. In the opinion of the learned Judges, the section on which Mr. Dickenson relied was inserted for no other purpose than to authorize a Company formed primarily for the supply of water for domestic purposes to sell water for other than these purposes. This, however, does not prevent such a Company from selling water by contract even for domestic purposes, if both parties to the bargain can agree upon the terms of payment; and the contract, once made, cannot be repudiated.

Adverting to the general law as to water supply by measure, we may point out that section 14 of the Water-Works Clauses Act 1863, carefully defines the position of the Company and the customer in regard to the meter, if once introduced into the consumer's premises. The "undertakers" may let for hire any meter or instrument for measuring the quantity of water supplied and consumed, and any pipes and apparatus for the conveyance, reception, and storeage of the water, "for such remuneration in money as may be agreed upon between them and the consumer." The remuneration is to be recoverable in the same manner as water-rates are recoverable; and the meters, instruments, pipes, and apparatus are not to be subject to distress for rent, or to be taken under any legal process against the consumer or the occupier of the premises. By section 15 of the same Act, the officers of the undertakers are empowered to enter premises, in order to inspect the meters there on hire, and to ascertain the quantity of water supplied or consumed. These and some subsidiary provisions of the Act certainly afford ample facilities to those who may elect to charge according to the measure of the water supplied.

But there are other considerations; and the existence of facilities has not gone far to induce the Companies to adopt the meter system. They have the option, but they do not (exercising their discretion) avail themselves of it. In the absence of any widespread discontent with the existing order of things, it cannot be assumed that the Legislature will nullify its previous deliberate and considered acts by abolishing the practice of payment by rates. It was after full inquiry that the rate system was authorized by the General

Act of 1847; and it was again considered and approved prior to the time of the passing of the Public Health Act, 1875. Reference also may be made to the report of the Select Committee on the Public Health Act (1875) Amendment Bill. It was submitted to the Committee that the prevailing practice of defraying the costs of water supply did not meet the equity of the case. Thus, a Sanitary Authority might recover the cost by charging the whole upon the rates (in which event it would be paid out of the rate for special purposes), or they might raise the necessary funds by means of water-rates and water-rents. Of the hardships and inconsistencies which were pointed out to the Committee, there would be no advantage in speaking at the present time. But the conclusion arrived at ought to be carefully borne in mind. The Committee, after full consideration, held that the sound principle to lay down is that water supplied by a Sanitary Authority should be paid for by the consumer; but that as it appeared that this principle, if carried to its full length, might in some cases cause the charge for water to be very high, "it was desirable that a maximum charge on the consumer should be established." On the other hand, the evidence showed that it was desirable to establish a minimum; and the Committee arrived at the opinion that a fair charge made directly upon the houses benefited would tend to disarm the opposition which might arise against the cost of the water-works being thrown on the rates.

These are contributions to water-works history and development which both parties engaged in the meter dispute should keep in view. They touch, of course, the principle involved; and that principle must necessarily be considered before there can be any far-reaching advantage, from a public point of view, in discussing the merits of different types of modern water-meters. But the meterites are under the impression—and there may be some foundation for the belief—that water engineers are averse to the general adoption of meters, partly because they have not taken pains to test the improved appliances which modern ingenuity has placed at their disposal. A common objection is that water-meters of the low-pressure kind require some separate mechanical contrivance for the purpose of turning on the supply to the meter as the water goes down in the cistern. It is only fair to say that there is at least one particular invention—Mr. W. Cowan's syphon water-meter, which was illustrated in the JOURNAL for Dec. 4 last year—in regard to which this objection cannot be made. It is claimed by Mr. Cowan that his meter has its own ball-valve and call; and, indeed, that it is in all respects complete within itself. Mr. Cowan is an active and persevering member of the meterite party—that is to say, of those who believe in the virtue of the low-pressure meters, as distinguished from the high-pressure positive meters, with which, as yet, water engineers are chiefly familiar. From a scientific and technical point of view, it is doubtless desirable that the competing claims of these various inventions should be fairly weighed, and, if possible, finally decided.

THE RETIREMENT OF THE CLERK AND ENGINEER OF THE METROPOLITAN BOARD.—At last Friday's meeting of the Metropolitan Board of Works, annual retiring allowances of £666 13s. 4d. and £1333 6s. 8d. respectively were granted to the Clerk (Mr. J. E. Wakefield) and Engineer (Sir J. W. Bazalgette) of the Board, whose recent resignations were noticed last week.

CONTINENTAL GAS COMPANIES AND THE ELECTRIC LIGHT.—It is reported that an interesting case will shortly occupy the attention of the Law Courts of Luxemburg. The City of Luxemburg granted in 1864 to the local Gas Company the exclusive right of laying down gas-pipes in the streets, and of supplying the city with gas. The Amsterdam representative of the firm of Siemens Bros. lately made arrangements to provide Luxemburg with the electric light, and asked the Municipality for authority to erect overhead wires, or lay down underground conduits; and permission was granted without hesitation. The Gas Company considers that this permission constitutes a breach of contract, and have requested the Municipality to have the wires removed, claiming damages at the same time. The Company assert that the intention of the contracting parties in 1864 was to give to the Company the exclusive right of lighting the city. The Municipality reply that this monopoly only applies to gas. As the introduction of the electric light depends upon a decision on this point, the result of the application of the Company to the Courts is awaited with some degree of eagerness.

THE LONDON COAL DUES.—The *Northern Echo* understands that Sir Joseph Pease, M.P., will, on the opening of Parliament, ask leave to bring in a Bill to prevent the Corporation of London exercising any rights which they claim independently of the expiring Coal and Wine Duties Act for measuring coals coming into the port of London and for charging dues thereon. Lord Randolph Churchill will probably be one of the backers of the Bill. Mr. Gladstone, in his retirement at Amalfi, has been questioned by Mr. Maltus Q. Holyoake upon his views as to whether the imposition of a proportional stamp duty on the tickets of admission to theatres, music halls, gate-money at race meetings, &c., in the area within the control of the London County Council, would not be a satisfactory substitute for the coal dues. The right honourable gentleman sent the following reply:—"Your letter opens a question of much interest, especially for those who, like myself, are no lovers of the coal duty; but I feel that it would be out of place, and would probably do mischief, were I to deliver opinions on the measures of finance which may or ought to be adopted by the County Councils."

Communicated Articles.

ON RECENT PROGRESS IN THE PURIFICATION OF COAL GAS FROM SULPHUR COMPOUNDS.

By H. LEICESTER GREVILLE, F.I.C., F.C.S.,
Chemist to the Commercial Gas Company.

Looking over the history of the past few years, there is little doubt that considerable progress has been made in gas purification, and more especially in methods for the removal of what is often termed "sulphur in other forms than sulphuretted hydrogen." Purification of gas from these compounds has always been regarded as a more or less difficult operation; but, as now usually conducted, there is a necessity for the exercise of more skill and of watchfulness rather than any real and actual difficulty. In addition, several alternative schemes for sulphur purification have been brought forward during the past two or three years, most of which appear to successfully accomplish the desired end, though in some the practical data are missing, or are too imperfect to allow of a correct judgment being formed of their actual working value. It is proposed in the present article to give a short account of what has recently been accomplished, practically and experimentally, in the purification of gas from sulphur compounds; offering at the same time such comments and explanations as are suggested by my own knowledge and experience of the subject. It is hoped that such an explanatory review, as it might be termed, will have double value—in the first place, that of putting on record, in brief form, what has been done; and, in the second place, that of making the record clear and acceptable to the general reader.

With regard to the sulphur compounds present in coal gas, it must be distinctly understood that, apart from sulphuretted hydrogen, we have no definite knowledge of their nature, beyond the fact that the main proportion exists as carbon disulphide. Of a total quantity of from 20 to 48 grains of sulphur per 100 cubic feet remaining in gas after the sulphuretted hydrogen has been extracted, the main proportion exists as carbon disulphide; and it is only the sulphur existing in this form that is removable by any known process. It is remarkable that the proportion of sulphur existing in other forms than that of sulphuretted hydrogen and carbon disulphide appears to be fairly constant. The sulphuretted hydrogen in the scrubbed gas as it enters the purifiers may vary from 350 to 800 grains per 100 cubic feet; and the sulphur in other forms from 18 to 48 grains, with varying conditions of condensation and temperature and different kinds of coals. But the proportion of sulphur in other forms than sulphuretted hydrogen and carbon disulphide remains fairly constant. This statement is founded on a wide experience in such varieties of coals as Waldridge, Londonderry, Wingate, Pelaw Main, Pelton Main, and Ravensworth Pelaw; and on an equally wide experience in the use of the Harcourt test for sulphur compounds as compared with the Referees test. The action of the former is known to depend on the conversion of carbon disulphide in the presence of aqueous vapour, into sulphuretted hydrogen; and it is admitted that the action of the platinized pumice in the lamp does not extend to the sulphur compounds other than carbon disulphide, and that a correction of 6 or 7 grains is made *as an addition*, for the "unlampable sulphur"—*i.e.*, sulphur present in other forms than carbon disulphide. With this correction, and with special care to maintain the platinized pumice in proper working condition, I have always found the amount of sulphur in the purified gas indicated by the Referees test and by the lamp to agree within 1 or 2 grains; thus proving that the sulphur in other forms than carbon disulphide is fairly represented by the usual addition of 6 to 7 grains to the indications of the lamp test. With this slight preliminary digression, I will turn to the subject specially under discussion.

Of the methods for removing carbon disulphide which are either known or have been advocated in the past few years, the following may be mentioned:—

1. The ordinary method by sulphided lime prepared by acting on clean lime with sulphuretted hydrogen derived from foul gas.
2. Mr. W. A. Valon's suggested oxygen purification.
3. Mr. J. Methven's method by means of air.
4. The Claus process of liquid purification in closed vessels.
5. Messrs. J. J. Hood and Gordon Salamon's scheme by the use of Weldon mud.
6. The scheme of Mr. W. Young as to the employment of hydrocarbons derived from coal tar.

In addition, I may include a method of my own, which has been successfully used, and which may have advantages under special circumstances.

With regard to the ordinary process of sulphur purification by means of lime more or less saturated with sulphuretted hydrogen, although the method is widely known and extensively practised, there appears to be a general belief that the results are not always reliable. This is indeed the case unless the material is prepared under suitable conditions. When a very low temperature is prevalent, lime will absorb a large quantity of sulphuretted hydrogen without acquiring much power of absorbing carbon disulphide; and any circumstance (such as the exposed condition of purifiers, or other cause) tending to keep down the temperature of the lime during sulphiding, will correspondingly lower the eventual efficiency of the material. I attribute this to the formation of inactive calcium sulphydrate, instead of the more active hydrated calcium sulphide, which is the product of a higher temperature. Every circumstance

tending to raise the temperature of the lime during sulphiding—such as having the proportion of sulphuretted hydrogen in the entering gas as large as possible, protecting the purifiers from the inclement action of the weather, and choosing a time when the general temperature is favourable—helps to produce an efficient material. Further, if the situation of the works with regard to nuisance permit of such proceeding, the discharge of the contents of a purifier after sulphiding, and a limited exposure to air (sufficient to cause the whole mass to heat and turn green), replacing the lime before oxidation has proceeded too far, will in all cases produce a material which will be specially active in the absorption of carbon disulphide. But to ensure the best and longest continued results with sulphided lime, however prepared, it should, after preparation, be only used on gas previously freed from all trace of carbonic acid, and practically free from sulphuretted hydrogen.

Of the methods of removing carbon disulphide which I have enumerated, Nos. 2 and 3 follow on as a legitimate sequence to No. 1; but before noticing these modifications of the use of lime, I will give a brief account of a process which I have successfully employed, and which may possibly be useful to others who can command similar conditions.

When we commenced the manufacture of sulphate of ammonia, it occurred to me that the waste gases from the sulphate-house might furnish the means of preparing calcium sulphide for sulphur purification. An examination of the gases revealed the fact that they had about the following composition, expressed as a percentage of the volume:—

Sulphuretted hydrogen	28·5
Carbonic acid	71·5

I was confident that if these gases were turned into a purifier charged with lime, the result would be a material active on carbon disulphide; but the large percentage of carbonic acid precluded the possibility of preparing a vessel which would last in active use for any considerable period, as the main proportion of the lime would necessarily become calcium carbonate. At the same time, as the gases passed into the lime were all absorbable, and not (as in the ordinary sulphiding process) accompanied by a preponderating volume of neutral and non-absorbable gas, I anticipated that the product between the reaction of the lime and the sulphurated hydrogen would, being formed at a comparatively high temperature, be correspondingly active in the subsequent combination with carbon disulphide. My anticipations in this respect were fully realized. A purifier measuring about 28 feet by 36 feet, and charged with six 10-inch tiers of lime, was put on to the waste gases from the sulphate-house; one of the plugs on the cover being left open. It was kept on until a faint stain of sulphuretted hydrogen was obtained on placing a lead paper in the purifier through the open plug on the cover. The lime had then taken up the following quantities of sulphuretted hydrogen and carbonic acid, calculated on the composition and volume of gas liquor which had been treated in the sulphate-house:—

Sulphuretted hydrogen . . .	5,709 lbs.	= 2·54 tons.
Carbonic acid	27,648 „	= 12·34 „

This vessel was subsequently employed in the practical removal of carbon disulphide from the gas for a period of 160 days, and took up as a grand total 5281 lbs., or 2·35 tons, of carbon disulphide. When first put to work, and for some considerable period afterwards, it removed 17 to 22 grains of sulphur per 100 cubic feet; passing altogether 323 million cubic feet of gas.

The preceding plan of sulphiding is, of course, only available for gas-works where sulphate of ammonia is being made; but with a little extra trouble, it is one by which a very effective sulphide vessel might be prepared by a plan which I have not yet had the opportunity of trying. It is well known that, although lime will absorb both carbonic acid and sulphuretted hydrogen, on the continued passage of a mixture of the two gases, the portion of lime sulphided becomes eventually carbonated—sulphuretted hydrogen being driven forward. In sulphiding with the waste gases from the sulphate-house, before the purifier passed even a trace of sulphuretted hydrogen, in all reasonable probability fully half the lime represented by the three lower tiers would be practically calcium carbonate. With a knowledge of this, I proposed to pass the waste gases into the top instead of into the bottom of the purifier; in other words, into the outlets, in lieu of the inlets. Sulphiding would then take place from the *top downwards*. When sulphuretted hydrogen appeared at the *bottom* of the mass of lime, the gases might be temporarily shut off, the cover lifted, and as much of the lime as appeared to be carbonated removed and fresh material substituted. The cover being replaced, the sulphiding process might be resumed until sulphuretted hydrogen again appeared through the mass. The practical effect of this treatment would be that a much larger proportion of calcium sulphide would be formed, and a more efficient purifier, as far as regards total available work, produced, than by the plan followed when my original experiment was tried. It would be worth testing the method, if only for the information to be gained by the trial; and I hope to have an opportunity of making a practical test at some future date.

(To be continued.)

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

VIII.

We have examined the circumstances obtaining under three conditions—viz., with three fishtail burners; with oil, candles, or modern gas-burners; and with ventilating gas-burners. In the first case there was 10½ cubic feet, and in the second 7½ cubic feet of carbonic acid to be removed by some means or other, and in the third, proper ventilation obtained without extraneous aid. We have now to imagine a fourth case; and that is the conditions of the atmosphere in the apartment when no artificial lights at all are in use, or if it was illuminated by the electric light, which is practically the same thing. When occupied by four persons, the air must be completely changed every 33 minutes. But rooms of the size mentioned, are frequently occupied by more than four persons. They may be used as class rooms, workshops, offices, &c., and as such be occupied by 8 or even 12 persons for some hours at a stretch. In the latter case, the product of carbonic acid would be 8¼ cubic feet per hour; and this illustration is sufficient to show the fallacy of the supposition that the introduction of the electric light is of itself sufficient to secure a healthy atmosphere. It also shows that, independent of the kind of light used, proper ventilating arrangements are positively necessary if the "limit of safety" is not to be exceeded; and the superiority of the ventilating gas light over all other forms of artificial illumination.*

A lecture on the "Combustion of Gas in Houses," delivered by Dr. Odling before the Metropolitan Association of Medical Officers of Health, is noticeable as dealing with the subject of gas consumption in a popular common-sense style, not encumbered by the scientific theory or masses of calculations with which it is frequently surrounded.† While admitting the existence of general complaints as to the heat, the dirtiness, the fouling of the atmosphere, and the closeness or oppressiveness caused by using gas, Dr. Odling states that there is no *primâ facie* objection to the use of gas, because we are unacquainted with the exact value of many of the products of gas combustion, and we are, moreover, not sufficiently acquainted with the influence on the human body of those products with whose nature we are more familiar. Therefore, whether or not gas was injurious to health was a matter of opinion based on observation, and should not be one of prejudice or jumping to conclusions. These words, though spoken twenty years ago, may fairly represent the state of knowledge in the medical profession as to the salubrity or otherwise of using gas, at the present time. The hygienic effect of the products of combustion has not been sufficiently marked as to lead to further special investigation as to their nature, or to the publication of any special warning or precaution about them. A great deal that is written or published is merely based on opinion, tinged with more or less prejudice and jumping to conclusions. No special disease has been laid at the door of coal gas; and the effects generally complained of are just those that might be expected to follow the inhalation of an atmosphere overcrowded with carbonic acid and moisture—to the general neglect, in short, of the proper precautions necessary to secure good ventilation.

Quoting Dr. Letheby, Dr. Odling shows that, as a matter of fact, gas produces less heat, light for light, than candles or oil; but this is to some extent neutralized by the fact that the amount of illumination of a room by gas is habitually eight, ten, or twenty times as great as it would be if some other and more expensive form of light was resorted to. Just as it gives less heat, so it absorbs less oxygen and generates a smaller quantity of products, when compared on an even basis with other agents. On the subject of dirt or sootiness, the lecturer asserts that the ceilings get dirty more quickly in rooms lighted by gas than when other illuminants are used. He illustrated the presence of soot or unconsumed carbon in a gas-flame, and the necessity of the same for the production of light, by experiments; also the fallacy of supposing that the presence of such soot was a proof of foulness or imperfect purification of the gas. It was shown that an insufficient supply of air led to the production of unconsumed carbon. Dr. Odling had no doubt that other illuminants produced as much or more soot than gas; but thought that it was more evident in the case of the latter, because it was burnt in larger quantity, inducing stronger upward currents of air, and also because the gas-burners were usually nearer the ceiling than candles or oil-lamps are usually placed. How far the assertion that ceilings get discoloured more rapidly in rooms lighted by gas is applicable to modern gas-burners and globes, is a question that may safely be left to those who actually use such articles. At the time of Dr. Odling's lecture, iron burners and narrow-bottomed globes were in vogue; and the sootiness complained of, and apparently considered inseparable from the use of gas, was really due to two causes—want of knowledge as to the proper mode of burning gas, and confusion of the brownish deposit due to the passage of organic matter present in the air, through the flame, with matters supposed to be evolved from the gas. A perpendicular flue pipe, carried up nearly to, or passing through the ceiling, will produce a brownish or blackish discolouration similar to that observed over a gas-flame, provided it is heated internally to a temperature high enough to secure the charring of the dust, fluff, and other organic matter that is always present in the air of our houses. If a porcelain calotte is placed over a gas-flame, this deposit can be obtained and examined, and readily proved to be of a different character from anything that may be expected to result from the combustion of gas. The blackening of ceilings can now be so easily prevented, that it need not be further considered. The existence of organic matter in the air, whether scorched or other-

* A translation of an interesting paper on "Ventilation," by General Morin, will be found in Vol. XIV. of the Journal, p. 632.

† Journal, Vol. XVIII., p. 81.

wise, may be cited as a plea for better ventilation. An interesting discussion followed the lecture; and its chief feature was a powerful defence of coal gas from the charges brought against it, by Mr. Hawksley. Mr. Finlay also insisted on the necessity for proper ventilation.

It is probable that many who write and talk about imperfect combustion and incompletely oxidized products have not given themselves the trouble to examine the constitution of coal gas. An examination of this will at once dispose of the absurd insinuation that certain poisonous products of an unknown character, are evolved. Considered in terms of percentage by weight, ordinary coal gas consists, roughly, of 10 per cent. of hydrogen, 60 per cent. of light carburetted hydrogen, 10 per cent. of heavy hydrocarbons, 15 per cent. of carbonic oxide, together with small quantities of nitrogen, oxygen, water, &c. Of these, hydrogen, light carburetted hydrogen, and carbonic oxide are very inflammable, and pass by simple reactions having no intermediate stage, into carbonic acid and water. The only way in which these could possibly contaminate the atmosphere, is by escaping unconsumed, and this (looking at their inflammable nature and the temperature of the flame) is inconceivable, in the presence of anything like a reasonable air supply. We must look to the 10 per cent. of hydrocarbon for the supposed intermediate products; and any terrors occasioned by the possible presence of these unknown substances is at once largely diminished by the fact that only one-tenth of the gas can have any share in producing them. But it is generally admitted that the presence of solid carbon in the flame is indispensable for the production of light. If this is so the decomposition of the hydrocarbons into their component elements must be fairly complete. If otherwise, the light-yielding powers of the flame will suffer. The hydrogen will be completely burnt; so that, following reasonable deductions based upon known facts, it can be demonstrated that the only intermediate products of combustion from coal gas are either unconsumed carbon or carbonic oxide. The presence of these admits of ready quantitative estimation, so that there need be no mystery about the nature of the products of combustion. In many parts of the United States, water gas is supplied containing 20 per cent. or more of carbonic oxide. I am not aware that any complaint has ever been raised as to the escape of carbonic oxide in an unconsumed state, when gas of this description is burnt. Such might certainly be expected if carbonic oxide is among the products of combustion from ordinary coal gas, which only contains about 5 per cent. of that substance. The data already given as to the production of carbonic acid and moisture, are quite sufficient to account for any complaints respecting the products of combustion from coal gas, that cannot be traced to the use of defective burners or globes. Looking at the unsatisfactory nature of the ventilating arrangements (or in many cases it would be more correct to say, at the entire absence of such) in our dwelling houses, it is only to be expected that such complaints should arise. As already remarked, the discontinuance of the use of gas is in no sense a remedy for them.

We have been considering the effect of gas in respect to human health and comfort; but there is another aspect of the matter that may be glanced at in passing. Not only is it advantageous to remove the products of combustion from the apartment in which they are generated, but if the gas is used as a means of giving light, the quality of the air supply to the burners is worthy of consideration. A gas-flame requires five or six times as much air as gas, and therefore the presence of even a trifling percentage of impurity, such as carbonic acid or water vapour, may have an important effect. Its deleterious influences are, so to speak, magnified. Carbonic acid is known to be, in some unexplainable way, antagonistic to combustion, and water vapour carries away a great deal of heat. When we remember that the illuminating effect and agreeable colour of the light are largely influenced by the temperature of the flame, which should be as high as possible, it is evident that anything which tends to reduce the temperature, even in a very small degree, may have an important effect on the illuminating power. The influence of impure air may be seen in a close cluster of gas-lights. The flames at the top of the cluster are continually wavering, and give very much less light than those at the bottom, because the air supply to them is contaminated by the products of combustion from the burners below. Messrs. Methven and Sugg have given a practical aspect to this question, by introducing a special air supply for gas-burners. This is freed from carbonic acid and moisture, and supplied to the burners in moderate, but not too great excess. The result is that the illuminating power of the gas is increased, as might reasonably be expected, to the extent of 10 or 15 per cent. The products of combustion can be applied for ventilating purposes; air from the apartment to be ventilated being allowed to mix with them after being clear of the burner; so their application for this purpose is by no means hindered or interfered with.

At the half-yearly meeting of the Brompton, Chatham, and Gillingham Water Company last Wednesday, the salary of the Secretary (Mr. G. G. Catt) was increased by £50 per annum.

We learn that Mr. Henry Simon, C.E., of Manchester, has been entrusted with the order for a complete sulphate of ammonia plant, capable of dealing with 24 tons of ammoniacal liquor per day, to be erected at the Thorncliffe Ironworks and Collieries of Messrs. Newton, Chambers, and Co., near Sheffield.

Technical Record.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual Meeting of this Association was held last Thursday, at the Hôtel Métropole, Whitehall Place, S.W. The members assembled in good number. The President (Mr. J. Somerville, of the Bankside works of the South Metropolitan Gas Company) took the chair about 5 p.m.; and the formal business was at once proceeded with.

It was agreed, on the suggestion of the Honorary Secretary (Mr. J. W. Helps, of Croydon), to take as read the minutes of the previous meeting.

Committee's Report.

The Hon. Secretary read the following report for the past year:—

In presenting this the fourteenth annual report to the members, the Committee feel that they will share in their satisfaction at the continued progress of the society in numbers and usefulness. There are now 79 members—a matter for congratulation when it is borne in mind that the district which they represent is as restricted in its extent as the qualification for membership is limited to engineers and managers.

During the year, three meetings were held; their success being in no small measure due to the heartfelt interest in them evinced by the energetic President, Mr. James L. Chapman. His address from the chair was a valuable contribution, dealing as it did not only with the economics of gas making, but also of distributing and selling.

The meeting on May 10 was a most enjoyable and instructive one. Leaving town by coach, the members broke a pleasant journey at Bentley Priory (lunching there at the kind invitation of Mr. John Chapman), thence continuing the drive to St. Albans, where they were received and shown over the gas and water works by the Engineer, Mr. A. F. Phillips. The breeze furnaces, sulphate plant, and gas-driven pumping-engine received a large amount of attention. The Abbey Church and the celebrated orchid houses of Mr. Saunders were also visited under the guidance of Mr. Phillips, who afterwards hospitably entertained the members at dinner in the Town Hall.

The success of the meeting in November was undoubtedly owing to the excellence and interest of the papers read by Mr. George Livesey and Mr. W. E. Price. That of the former was productive of a most valuable and exhaustive discussion on the theory and practice of gasholder construction—a subject which the author had already brought to a high degree of excellence. Mr. Price's paper was an interesting and useful one, pointing out and urging the necessity for looking after gas consumers, instead of leaving them to take care of themselves.

The Committee have again decided to present each member with that most useful volume, the collection of District Association reports for 1888.

The Committee feel they cannot close this report without paying a warm tribute to the indefatigability and interest evinced in all the Society's affairs by the Honorary Secretary, Mr. J. W. Helps.

The balance-sheet shows the receipts for the year to have been £51 5s.; the sum brought forward from the previous year being £40 17s. 9d. The expenditure has been £45 12s. 3d.; thus leaving a balance in hand of £46 9s. 11d.

Election of New Members.

The following gentlemen were unanimously elected members of the Association:—Mr. J. Tysoe, of the East Greenwich works of the South Metropolitan Gas Company; Mr. S. Temblett, of the Andover Gas-Works; and Mr. J. Creighton, of the North Middlesex Gas-Works, Mill Hill, N.W.

The President then read the following

INAUGURAL ADDRESS.

Gentlemen,—Allow me to thank you very sincerely for choosing me to occupy this seat of honour, and be your President for the year. I assure you I will endeavour to perform the duties appertaining to the honourable position with all the diligence I can command, and to the best of my ability; and I trust I shall succeed in conducting the business of our Association to your satisfaction, and, if possible, to my own.

It is usual, at our first meeting of the year, to look around us; to pause and consider our position; to review the road along which we have come, and see whether it has been well with us, what mistakes may have been made, what successes achieved, what has been gained from the past, and what we have to do and to avoid in the future.

In the first place, we must congratulate ourselves upon the continued progress and prosperity of our Association. The accession of new members is a proof, if any were wanting, of the estimation in which the Association is held; and the enrolment of good working members is a sure source of strength and stability to our Society, the success of which we all so heartily desire. There is deep down in our hearts a real love for the "Southern"—a real *esprit de corps* among our members—which is very gratifying. There is a strong feeling animating each and every individual member that this Association of Gas Engineers and Managers shall not "take a back seat," but endeavour to keep in the front rank. This has been the aim ever since its formation; and it is our united aim to-day. Great credit must be given for the zeal and industry devoted to the Association for many years by Mr. J. L. Chapman, the late Secretary and Past-President. To him, in a great measure, has been due the success and the pleasures which have hitherto attended all our meetings; and I feel quite sure that we have in our new Secretary, Mr. Helps, the same amount of "go" and energy, which augurs well for our continued success and well-being in the future.

On looking back at the year that has now gone, we can say it has been one of continued prosperity in the gas industry. Nearly all works have to record a continued increase in the make and consumption of gas—some a little, some more, and others a good increase over the previous year's business, which must be evidence

of a very healthy state of things. Coal—the raw material from which we produce our gas—has remained at a favourable price; freights have ruled low throughout the year, except a slight increase towards the end. The sale of coke has been remarkably good, and at good prices; and stocks have been reduced to *nil*. It is somewhat difficult to account for the great demand for coke which set in early last summer; but a revival and an increase of trade generally may account for some of it. Breaking it into a suitable size for domestic and industrial purposes has undoubtedly exercised a very beneficial influence, and assisted largely to create a demand which did not exist before. People now find in broken coke a clean, strong fuel, giving greater heat than can be obtained from the same weight of coal or slack, and free from objectionable smoke, which thus enables them to carry on their business without any fear of the Smoke Inspector's visits.

Tar and ammoniacal liquor residuals have improved slightly over last year's prices; but are still below the rates which prevailed a few years ago. At the same time the prices are improving, and perhaps in a few years may again reach the maximum. Whether this is desirable is doubtful; because when prices rule abnormally high for tar, it may bring into action a certain class of works erected for the sole purpose of manufacturing that article, which with us is a bye-product consequent upon the manufacture of our gas, and which we must continue to make in ever-increasing quantities as the demand for gas goes on increasing. We could, however, wish prices to be a little higher for our other product—ammoniacal liquor.

With regard to the price of gas, it is pleasing to notice the continued reductions in this our staple production. There is noticeable in the columns of the JOURNAL OF GAS LIGHTING, almost week by week, a standing paragraph recording "Reductions in the Price of Gas" all over the United Kingdom. This is another healthy sign of the times, for when any commodity in daily use can be supplied good and cheap, there is sure to be an increasing demand for it; and the greater demand stimulates and tends to economical production. The demand for gas is also greatly on the increase for cooking and heating stoves, gas-engines, and other industrial purposes; and gas is now also coming into extended use for ventilating purposes. You will notice in this building (the Hôtel Métropole) that although they have for the time yielded to the demand for something novel, and perhaps for advertisement purposes, regardless of cost, and lighted the rooms with electricity, they are compelled to bring gas to their aid for the purpose of making the rooms habitable by utilizing it for ventilating the various rooms; and there appears to be as much gas employed for this purpose which, had it been intelligently applied in the modern regenerator burners, would have sufficed for the perfect illumination as well as the proper ventilation of these rooms. But one may be told that this matter is their business and not ours.

One firm of gas-engine makers—Messrs. Crossley—have sold in London alone 2000 "Otto" gas-engines, equalling 20,000 indicated horse power, and consuming about 3½ million cubic feet per diem, or in money value about £124,500 per annum; and the increased demand for gas-stoves is remarkable. The South Metropolitan Gas Company had a large increase this last year in cooking-stoves, as well as in gas-fires for heating purposes; and the demand is still increasing. The Local Authorities are also awakening to the demand for "more light" in the public lamps; and some are having 10-feet burners in improved lanterns substituted for the old 5-feet per hour lights. So that all along the line, look where you will, there is a healthy growing demand for gas.

A writer on "Coal Gas" in the just completed ninth issue of the "Encyclopædia Britannica" says: "The processes involved in the preparation, distribution, and consumption of coal gas still remain essentially the same as when the system was first elaborated." One does not know who writes these articles, nor is it worth while inquiring. It may be inferred, however, that it is not a gas engineer or manager, or anyone who knows much about gas-works, but someone who is inimical to gas interests, and in favour of the electric light, as, further on in the same article, he refers to the "evil odours which attach to the gas-works," and that "electric lighting will in the near future supersede gas." These writers, and electromaniacs generally, always put the time of electricity in the "near future." It was in the "near future" ten years ago, and I believe it will be still in the same place ten years hence. They one and all seem to be imbued with a large amount of hope; suggesting Burns's lines (slightly altered) when he says:

> "Hope springs exulting on triumphant wings,
> That thus they all shall meet in future days,
> There ever bask in their own created rays."

My object in quoting the remark is to point out the unfairness of the Encyclopædist, who, no doubt, intended it to be inferred that no progress had been made in our industry during the eighty or ninety years of its existence. He might just as well have said that the sun shines to-day essentially in the same manner as it did a thousand years ago. We know there has been great progress in everything appertaining to gas matters, alike in preparation, distribution, and consumption, in the last forty years; and this I can personally vouch for. No doubt we distil coals in retorts now as we did then; but we do it in a very different manner. Although we still retain the names of retorts and furnaces, as we do the names of steam-engines and boilers, the process of carbonizing is totally different, as the steam-engines and boilers of to-day are totally different from those of fifty or a hundred years ago.

Forty years ago coal was distilled at very low heats in small iron retorts making hydrocarbon vapours of low quality—only 9 or 10 candles illuminating power. Now high heats prevail with fire-clay retorts, making a greatly increased yield of permanent gases of 16 or 17 candle power, which are carried to the consumers' burners without suffering any deterioration. Forty years ago the loss by condensation in the street-mains was from 30 to 40 per cent.; now it is not more than 5 or 6 per cent. of the make. In the "forties," engines, boilers, and exhausters, station meters, and governors, were but just coming into use, and were only to be found in the very largest works; centre-valves, wet and dry scrubbers, tar extractors, &c., were unknown. Purification was then a good deal a matter of chance. When the wet-lime purifier showed a dark stain on lead paper, it was changed. There is hardly such a thing as a wet-lime purifier now-a-days; the whole process of purification is changed. Sulphur compounds were not then known; testing the gas, either for purity or for illuminating power, was never thought of; carbonic acid, ammonia, and bisulphide of carbon were never mentioned or considered as harmful; oxide of iron or catch purifiers were not dreamt of; and tar and ammoniacal liquor were run to waste, or got rid of somehow without returning any revenue—coke, breeze, and foul lime being the only residuals of any value. The universal burners then in use were the cock-spur and single-jet (commonly called the "rat-tail"); the Argand, union-jet, and batswing were only being tried. The contract system of burning was then in vogue, at a charge of 6d. a week in the summer months, and 1s. in the winter for a rat-tail 5 inches long; the lamplighter turning off the tap outside the house at eleven o'clock as he went his rounds for putting out the public lamps. Consumers' meters were hardly known—only beginning to be used—and were not at all appreciated, there being a strong feeling against them, as they were a puzzle and a mystery to the average consumer. All this is quite changed, as we know; and the man who says gas making to-day is the same as when it was first elaborated, does not know much about the gas industry or the steady progress constantly going on.

In the last ten years great changes have been made in our retort-houses. Generator and regenerator furnaces are now general, effecting considerable economy in fuel, so that 2 cwt. of coke carbonizes a ton of coal, instead of 3 cwt. in the old form of furnace. The introduction of machinery for drawing and charging the retorts is another great improvement, leading to considerable economy in carbonizing wages. With the introduction of this improvement I had a good deal to do; and I retain a rather vivid recollection of the trials and struggles of its early existence when working with the Best and Holden machines for a year or two, and then with my own bantling, which was strangled in its infancy owing to company-mongering. A company got hold of it, and ruined both it and the Best and Holden steam-stokers. It is not at all a pleasant thing to be called up at two o'clock on a cold, wet, slushy morning in mid-winter, by a night foreman ringing the bell as if the house was on fire, and on putting your head out of the window to hear him, before you could ask the question, "What is the matter?" say "Masther, the iron man is broke down agin; the three scoops are stuck fast in the retorts, and eight or ten cogs are stripped off the driving-wheel. What shall I do, at all, at all?" And then to walk a mile or more through slush and mire—for these breakdowns generally occurred at night, and in the worst of weather—to find the machinery stuck fast, and the three scoops unable to be moved either in or out of the retorts, and perhaps slowly melting or burning away. I regret to say the cause of these troubles and breakdowns was not always fair wear and tear. It would not, however, serve any useful purpose to enter into an explanation of them here; and it is all ancient history now, with which you need not be troubled. We have in Messrs. West's, Foulis's, and Ross's stokers very efficient machinery for drawing and charging the retorts; and it is gratifying to record that their use is extending.

High heats in the retorts for carbonizing are now pretty universal, with the result of an increased yield per ton of more permanent gas than when low heats are employed. Low heats are not economical in any sense, and tend greatly to a high percentage of leakage—which is really loss by condensation. My experience has led me to see that high heats are best both for yield and quality of gas, and such gas is quite unaffected by temperature, pressure, or friction through the street mains. Consequently, there is less condensation, and better quality at the consumers' burners, no matter how far the gas may have to travel. The great difficulty in the way is that bugbear of the retort-house—stopped ascension-pipes. When starting a new section of retorts which have attained a good working white heat, with the yield of gas up to a satisfactory point, this obstacle of stopped pipes comes along, and puts its veto on the arrangement, necessitating the closing of the dampers, no matter whether one is working with a light seal or with anti-dips. With a heavy seal, of course they are a great deal worse; but no one works with a heavy seal now-a-days, except without an exhauster.

It is my experience that gas should not be allowed to pass from the hydraulic main to the condenser proper without undergoing a very gradual cooling in pipes laid on top of the retort-benches, then along the inside walls of the retort-house, and having perforated straining-plates at each 9-feet length of pipe, to cause friction to the gas, in order that it may quickly get rid of the heavy tars while it is still hot, or above 100° Fahr.; so that by the time it arrives at the condenser, there should be a very gradual decrease in the temperature. If the gas is (say) 125° Fahr. at the hydraulic

main, there should be no sudden decrease at any point—not more than 1° for every 10-feet length of pipe—and it should enter the condenser outside the retort-house, at from 95° to 100°, where there should be a further cooling down to 60° supposing the atmosphere to be about 56° or 60° Fahr. This rule may be applicable to any sized works by varying the diameter and length of the hot condensing or foul main according to the make of gas and the distance to be travelled. This method of hot-frictional condensation is, in my experience, the best and surest manner of retaining naphthalene in the gas, and preventing it from settling and depositing in the works or street mains. I may mention that when I took charge of the Bankside works, it was a standing rule to shut down the meter every two or three months, and take from the outlet-pipe barrow-loads of naphthalene. It was usually 2 or 3 inches thick on the inside of the pipes. There were also two working-up mains for upwards of half-a-mile to the gasholders—one being at work while the other was being cleaned out and freed from naphthalene. Since I made the alterations to the condensing arrangement, and put up the hot-frictional condensing main as described—now some seven or eight years ago—naphthalene is and has been unknown, and neither the meter nor the working-up mains have required to be cleaned out once. I instance this in order that those of you who are at all troubled with this deposit may do likewise.

With regard to washers and scrubbers, it is only a matter of choice of apparatus. Some engineers favour a certain form, while others prefer some other form or arrangement. They are all very effective, and should find a place in every gas-works. And whether steam is to be generated to drive an engine to actuate some forms of washer-scrubbers, or whether it be used to pump liquor up 60 feet high, is a question for the individual engineer and manager to determine for himself which best meets his requirements. Perhaps it may not be generally known that a considerable increase of ammoniacal liquor is to be obtained by washing the tar with cold water. There is a gain of 2 to 3 gallons of 8-oz. liquor per ton of coal by this practice. You are aware that, in distilling tar, the first product which comes over is ammoniacal liquor—about 4 per cent. of the bulk. This liquor is held in mechanical suspension, and we do not get paid for it when it is sent away in barges or tanks with tar; but by washing the tar with cold water as it is being pumped into the store-tanks, a good deal of this ammonia can be washed out and sent into the liquor-tanks.

The subject of purification is one of great importance in gas manufacture. In fact, it has become quite a delicate chemical operation now, as compared with what it was only twenty years ago. To ensure the perfect working of the purifiers, one must be in constant touch with them, and know every few hours the state of the material inside each box (especially the sulphide of calcium and carbonic acid boxes), and must be cognizant and familiar with every change that is taking place in the condition of the purifiers, so as to be ready at the right moment to change them. The writer in the "Encyclopædia Britannica," refers to the "evil odours attached to the gas-works"—no doubt alluding to the emptying and refilling of the purifiers. One is obliged to confess that there is sometimes cause for this remark at certain works; but I maintain that "evil odours" are not at all a necessary accompaniment of gas manufacture, and they, with due care and vigilance, can be avoided. They are to a great extent non-existant in Metropolitan works; but, untortunately, this cannot be said of all country gas-works, and particularly those which do not work under what are known as the "sulphur clauses," though even they should not be under the suspicion of making a smell. It is a fact, however, that very often anyone passing in the vicinity of a gas-works becomes unpleasantly aware of their existence. I may say that on several occesions, within the last six or seven years, persons who have called at my works, who had not been there before, have remarked that they had some difficulty in finding my office. They said they thought that by following their nose they would be sure to find the works without much trouble; but in my case their nose did not serve them, for they could not tell that they were near a gas-works when they passed the gates. I venture to think that this is as it should be; and there is not much trouble in carrying on works so as to be free from smells, with a set of six purifiers, and working under the "sulphur clauses." The method of purification I adopt is this: The first two purifiers are filled with oxide of iron for taking out sulphuretted hydrogen; the next two contain lime, for removing carbonic acid and bisulphide of carbon. They are alternately sulphided in this way: When a lime box is refilled, the first two, or sulphuretted hydrogen boxes, are bye-passed for about 24 hours, according to the make. The crude gas, with its sulphuretted hydrogen, passes into, and sulphides the first lime box; and when the lime in that box is converted into sulphide of calcium, the bye-pass is closed, and the foul gas again goes through the first two boxes, taking out the whole of the sulphuretted hydrogen by means of oxide of iron, while the first of the lime boxes will go on for a month or more taking out the sulphur compounds, while the second (which had been previously sulphided) is taking out the carbonic acid, and is being converted into carbonate of lime, the sulphide being driven forward and taken up by the oxide in the two catch purifiers. The lime from the second box is quite white, or with a little tinge of rose colour, and is devoid of smell. I have here, for your inspection, a sample taken out of our last changed purifier. The operation of emptying is quite unnoticed as far as smell goes. By this means the bisulphide of carbon can be kept down to within 15 grains per 100 cubic feet, at a cost of 6d. per ton of coal. Perhaps this is not the usual method adopted; but want of space partly compelled the arrangement, and it is perhaps as economical as any other.

I do not lay claim to any originality in this method of purification for eliminating the sulphur compounds other than sulphuretted hydrogen, and for carbonating the last lime purifier; but followed on the lines laid down some years ago by the late Mr. R. H. Patterson, and also Mr. Geo. Anderson, who was one of the first to show practically how lime could be carbonated, and so made inodorous when taken out of the purifiers into the open air. And in no gas-works of any size should difficulty be found in keeping the bisulphide of carbon below 20 grains, when there would be fewer complaints of impurity than are now at times made of the gas sent out from some large Corporation works in the northern and midland districts, for which there really is no excuse, as it does not require any extraordinary expenditure of money. Probably only a little rearrangement of valves and connections to work the purifiers in a certain manner may be all that is necessary.

I should also like to mention that it is my experience that ample area and plenty of time are two of the most important elements in economical purification. If there is large area, there will be plenty of time-contact. I believe it is possible to have too many purifiers if they are small ones, because the gas rushes through them at such a speed as allows but little time for the material, whether lime or oxide, to absorb and take out the impurities properly. If there are (say) twelve purifiers 20 feet square for a certain make of gas per 24 hours, the gas will be much better purified, and at less cost if the twelve are converted into six purifiers 40 feet by 20 feet—thus doubling the area, and giving a slow rate of speed through them. Some people have thought and written about purifying area and the cubical contents of purifiers as if the boxes were empty, and the flow of gas through them similar to a stream of water entering a large pond, and passing very slowly through it. It would be something like this if the boxes were quite empty; but we know they are filled up solid, although the material is porous, and the speed of the gas is about the same as that at which it flows through the connecting mains if the purifiers are of small area. Therefore, in putting down new purifiers, care should be taken to allow plenty of area. At our new East Greenwich works we are putting down six purifiers, 90 feet by 30 feet, for a make of 5 millions per day.

I have found by experience that it is much better, and more economical, to cause the gas to pass through the boxes downwards instead of upwards. The material is better utilized in the corners; and no difficulty arises with blow-holes, which sometimes occurs when the gas is forced upwards. Then, further, to avoid smells, all the tar and ammoniacal liquor tanks and seal-cups should be kept constantly covered, to prevent any escape of sulphuretted hydrogen and ammoniacal vapours. This also tends to economy, because ammonia is very volatile and easily lost. If you expose uncovered to the air, for a day or two, a pailful of ammoniacal liquor of 8 or 10 oz. strength, you will find, on re-testing it, that the greater part of the ammonia is gone. Moist air is very greedy of ammonia; and all tar and liquor pump stuffing-boxes should never be allowed to leak, but always be kept tightly packed.

The hot coke drawn from the retorts should, as far as practicable, be quenched in the retort-house, and not on the coke-ground, because the water thrown upon it sets free a portion of the sulphur contained in the glowing coke, producing sulphuretted hydrogen, which, when the coke is cooled in the retort-house, passes upwards with the steam through the ventilators in the roof, without causing any annoyance. The revivification of the oxide of iron should also be done under cover as much as possible, so that any fumes given off, although harmless, may find their way out through the openings in the roof.

It has recently been lamented that the infancy of the gas industry had not been watched over, and taken hold of, by chemists instead of by engineers; and it has been suggested that had this been done it would have been in a much better position than it is to-day. I cannot at all agree with this idea; for chemists, as a rule, are not apt at designing machinery, and have but little acquaintance with applied mechanics or engineering questions, which appear to me to be the very essential and chief points required in a gas manager. Therefore I, for one, think that the gas industry will be but in a poor way if chemists instead of engineers had had much to do with its early struggles. Chemists appear to me (and I say it with all due deference) to be totally unsuited for the somewhat rough and grimy work of a retort-house or purifying-house. They appear to be more at home and more in their sphere under cover in the laboratory, studying and experimenting, than exposed to all weathers and outdoor work. There has been ample opportunity for them to interest themselves in gas matters if they so desired, during the past half century; but what, it may be asked, have they done, in connection with either the manufacture or distribution of gas. I think but very little, except to find fault with certain things which they left to engineers to remedy. They have, I admit, taken some interest in our residual products; and we hope they will take still further interest in them, as it is much more in their line, and there is yet a wide field for them.

There are some chemists in the present day who suggest that gas companies wilfully stop up the street mains with naphthalene, to prevent their customers getting a sufficient supply of gas. If, instead of stating such absurdities, they would attempt to find out or show how to prevent such deposits in the mains, services, and meters, they might have some claim to our gratitude. If, instead of always finding fault, they would come to us with

any feasible suggestions to improve manufacture, distribution, combustion, or ventilation, we should be only too willing to hear them. As an instance, I may mention the Claus process for the purification of gas in closed vessels. For two years or more, Mr. Claus, Professor Heaton, and other chemists, were experimenting at our Old Kent Road works. During this time they took out several patents; and we now pay them a royalty on the amount of sulphur we sell from their "sulphur recovery process." There are several other matters requiring to be solved, if chemists considered it worth while to look into them; and these I may mention later.

If chemists instead of engineers had taken to gas making, we should probably never have heard of the exhauster, wet and dry meters, the governor, mechanical stoking, and the many other engineering improvements of modern times; and does anyone imagine that a chemist would ever be able to make a new departure (say) in gasholder construction? It requires an engineer to design and construct such mammoth gasholders as are now absolutely necessary in all large establishments for economical working. We have never heard of a chemist bringing out a new or improved burner; it requires an engineer to perfect a burner like the Sugg-Methven lamp, which we have here. There is, however, some work for the chemists in a gas-works, but very much more for the engineer. At the same time I would earnestly impress upon all our younger members, and those who seek to join our profession, to learn as much as possible of the chemistry relating to our industry—not to take it up for the purpose of being able to make pretty laboratory experiments, or as an amusement, but to thoroughly understand the whole nature and condition of the process of gas manufacture and consumption, from the time the coals are taken out of the pits until the products of combustion from a gas-burner leave the rooms wherein gas is being consumed.

About thirty years ago, chemists, somehow or other, assumed the *rôle* of censorship towards gas companies; and this spirit seems to have prevailed down to the present time. Why chemists instead of engineers should always be appointed as gas examiners seems difficult to explain. They surely cannot claim that their eyesight is more correct, or that they can define a line or distinguish shades of colour on the photometer disc with more exactness than engineers can do it. Perhaps owing to their training having always been in experimenting, and not in manufacturing or producing anything, they seem to become so accustomed to failures in their analysis and experiments, that they cannot conceive how gas can be made constantly from day to day, week to week, and month to month, of one uniform quality. Some of them appear to think there are, and must be, frequent breakdowns at the works—that something goes wrong every day or week, and that consequently the illuminating power of the gas varies hourly and daily by 2 or 3 candles. Of course, we know it is not so, and that breakdowns or failures of any kind are very rare at any works.

I look forward to the time when the illuminating power of our gas will be tested automatically by an instrument resembling (say) an aneroid barometer, when one only need glance at a pointer—if necessary, registering to ascertain the exact illuminating power of the gas—an instrument which may be placed in a public window, where those interested can see for themselves, and which can be accepted as correct by both gas manufacturers and gas consumers, which will be independent of, and without any such intervention as human optics (some operators reading low and others high), discoloured discs, candle standards varying from 10 to 15 per cent., varying water-lines, centring lines, hanging balances, impressionable timekeepers, high and low temperatures, imperfect ventilation, high and low barometers, and a series of arithmetical problems to be worked out, and all such adventitious aids, which are now resorted to for ascertaining what, after all, should be a very simple matter, but which chemists have somehow succeeded in surrounding with complications which are so many increased sources of error, instead of making the matter simpler. I am not without hope that, sooner or later, such an instrument will be produced, and thus save a great amount of unnecessary friction between local authorities and the suppliers of gas, the existence of which is not at all an enviable state of things. Surely it is time that, in this so-called scientific age of progress, some improved instrument for ascertaining the light-giving qualities of a gas-flame other than the antiquated method founded on Count Rumford's shadow screens and corrections, which take no account of the moisture in the air, should be devised.

I mention this subject of moisture in the air because in the first half of last year I was sometimes greatly puzzled to account for the variations in the illuminating power in the returns of the gas examiners; and I began to suspect there ought to be some other correction which the thermometer and barometer did not take into account. I had just heard of Mr. Methven's experiments; so since last July I have kept a record of the difference between the wet and dry bulb thermometers, indicating the dryness and moisture in the air, which, I think, accounts for the variations shown by the photometers. I will just give you one instance. In the month of August and during a good part of July the difference between the two bulbs only ranged between 2° and 3°, and the returns from the various testing-places averaged 16·2 and 16·3 candles. In a day or two the difference between the bulbs rose to 9°; showing that the air was very dry. The returns came in averaging 16·8, 16·9, and some as high as 17 and 17·4 candles; while at the works the gas sent out was of the same constant quality. When the difference between the two bulbs fell again to 3° and 2°, within two or three days the returns from the gas examiners also fell to 16, 16·1, and 16·2 candles. I have no doubt you have noticed that on some nights the gas-lights in the public lamps seem to burn very much brighter, and give more light, than they do on other nights. I think the presence of moisture in the air accounts a good deal for the difference; and lately I have been carrying out experiments, which some of you may also like to try. By passing the air supplied to the burner over a layer of chloride of calcium, it is dried, and the illuminating power is improved from ½ to ⅔ of a candle. But by causing it to flow over some wet sponges and cloths, it is reduced by ½ candle, and sometimes even more. I have therefore come to the conclusion that the condition of the atmosphere in which the gas is consumed has a great deal to do with its illuminating power, and with the low returns sometimes recorded by the gas examiners. It would appear as if all the onerous conditions attached to the apparatus of a gas-testing place do not satisfy the authorities, for during the last few years they have devised a portable arrangement to go poking about into side and by-streets, to try and find a little inferior gas somewhere, if it cannot be found at the prescribed place for testing; so that by chance they may light upon a small main containing a little stagnant gas, where there is little or no consumption, and where it is just possible they may get a test below the standard. But we know that this method of gas testing cannot be in accordance with either the letter or the spirit of the Act of Parliament. In Herr Lux's specific gravity balance, described by him at recent meetings of The Gas Institute, there is a step towards my ideal automatic indicator. When the moisture and carbonic acid are perfectly removed from the gas, and other precautions are taken, I am under the impression that the density of our gas will be as perfect—perhaps even more perfect—an indicator of its illuminating power than some recently so-called improved photometers, and will only require a year or so of practice with it, and experience of its working, to justify complete confidence in its records.

The present time is very favourable for considering the subject of new works or the extension of plant or mains. All materials are now at very reasonable, not to say low, prices. Iron and mains, as well as fire-bricks, retorts, and building materials generally, were never known to be so cheap; so that works can be built for nearly half what they would have cost not many years ago. The last decade has witnessed remarkable strides in connection with the erection of gasholders, which hitherto were the most costly structures in a gas-works—storeage capacity usually costing from £20 to £30 per 1000 cubic feet, and more in many cases. Now, by the recent reform in gasholder construction initiated by one of our members and Past-Presidents, Mr. George Livesey, gas storeage can be obtained for about one-fourth the amount that would have been required a few years since. The first one put up at the Old Kent Road works had a capacity of 5½million. I may mention incidentally that I staked it out with Messrs. Docwra's manager just ten years ago this week, in what was then a market garden a foot deep in snow. The cost of the storeage capacity of this holder and tank was only £8 10s. per 1000 cubic feet. The second one, at East Greenwich works, is just finished. It will hold 8¼ million cubic feet; the cost per 1000 cubic feet capacity for tank and holder being only £7. Of course, the larger the holder can be built the greater tendency will there be to economy; but smaller holders on similar lines, and without great masses of iron for columns and crown trussing, can be constructed for from 30 to 50 per cent. less than they could ten years ago. As you all know, the greater economy that can be exercised in spending capital judiciously, the more we are strengthening our position, and studying the interests of our patrons, the public.

From the experience of the working, and of the very satisfactory manner in which these large gasholders perform their functions, their steadiness and stability during the continuance of the strongest gales and storms (and in this respect, as well as in others, they work very much better than the old type of holders, having only radial rollers, which do not prevent excessive oscillation in a gale of wind), there would appear to be no reason why, for all large works, the size should not be still further increased, and holders built of 300 feet diameter with four 50-feet lifts, capable of storing from 13 to 14 millions at a probable cost of only £5 per 1000 cubic feet of storeage capacity for tank and holder. And we must bear in mind also that the greater the base area, having a suitable proportion in height, the more stable and secure will be the structure. Some people will be still inclined to say: "I don't like to put all my eggs in one basket; I want to be cautious." There is no doubt it is always well to be cautious; but such caution is not foresight or wariness; it is rather the result of inexperience and want of knowledge. And when we hear of two or three of these frail "baskets" of the old type of gasholders, containing all the "eggs" of a gas company, being toppled over and damaged in less than ten minutes by a gale of wind, as was the case at the Citizens' Gas Company of Brooklyn (N.Y.) a few weeks ago, it certainly would be far preferable to have all the gas stored in one good, strong, reliable structure, having a broad base and with suitable height to withstand any storm or strain that might come upon it.

While on the subject of gasholder construction—no; I am not going to say a single word to you about self-sustaining holders. There may be something to say about them when one or two have been at work for a few years, and when we know what their record is after the effect upon them of a 80-lb. equinoctial gale. I should

just like to mention that there was much interest in the articles on "The Guide-Framing of Gasholders" contributed to the JOURNAL OF GAS LIGHTING last year by "Theory and Practice," with the most of which I can agree, except one item in his theory which does not accord with my practice, and which doubtless the author would like to know as well as others. He stated that "iron shortens or lengthens about 1-12,000th part of its length for every ton per square inch upon it, and that the top curb of a gasholder 200 feet in diameter, having 4 tons per square inch of strain upon it, will shorten at least 2½ inches, and so reduce the diameter more than ¾ of an inch. It follows, therefore, that *the top rollers are off the guide face by ¾ of an inch all round* when the holder is right up and the curb is fully strained"—the italics are the author's, not mine. Now, it happened, about a fortnight before this was published, that I was present at the first cupping of the fourth lift of our large holder at East Greenwich, as I had previously watched and noted the cupping of the other lifts, to see the effect upon the rollers and guides; and although I fully expected that there would be some alteration, as each succeeding grip took hold, the effect upon the radial rollers was *nil*. Nor were the tangential rollers drawn inwards a hair's breadth. They each and all remained in exactly the same position as when gas was first let in—tight against the guide-paths all round; no play being allowed in the top radial rollers. It was also noticed that the action of cupping and uncupping had the opposite effect to what "Theory and Practice" says it ought to be; for when the holder is going down, and each cup leaves or releases the grips, the radial rollers, which are fixed in carriages on the grips, leave the guide-paths nearly ¼ inch, and when cupping the rollers again take their proper bearing against the guides. As the floating weight of the four lifts of this holder is about 1050 tons, and the diameter of the inner lift is 240 feet, having a section of 55 square inches in the top curb, and a compression strain greater than 4 tons per square inch of section, according to "Theory and Practice," it ought to have shortened more, and become much smaller in diameter, and each roller leave the guides a good deal more than ¾ inch when full up. Let us be thankful that sometimes ordinary theory and practice will not always agree.

I intended noticing some of the recent inventions which came before us last year, but find the space and time I have allotted to myself will not admit of it. I cannot, however, overlook one of great importance to our outdoor work in taking up old mains without injury to them so that they can be relaid again "as good as new," without the usual 4 or 5 inches with the spigot bead having been cut off, and the end probably split for a few inches, often necessitating another few inches or a foot shortening by cutting off the split end, and thus causing waste in material and time. I allude to the patent pipe extractor invented by our worthy Secretary, Mr. Helps, which I am pleased to hear is being so largely appreciated, as it ought to be, as it is such a great improvement upon the old and clumsy jack arrangement which is sometimes resorted to for the purpose.

It is usual to make some reference to the progress of our rivals engaged in the work of enlightening the public. We are glad to see they also, like ourselves, are progressing; and we can congratulate them upon the improvements they have in the last few years made, and are still making, and compliment them upon the great exertions they are using to gain some share of the public favour. The oil-lamps are being much improved in construction, so that now they give nearly double the light they did a few years ago. The firm of Messrs. Defries are making great efforts to introduce them; and are slowly succeeding. We are pleased to see the lamps they are putting forward are considered to be safer, and not so liable to explode, as those hitherto in use. This is greatly to be desired, as I see that the deaths caused by oil-lamps, in Great Britain and Ireland alone, are stated to be about 300 a year. This fearful annual sacrifice of human life cries aloud for remedy; and Messrs. Defries and other lamp improvers deserve success, if they can supply to our poorer brethren non-explosive lamps, which at the same time give a good light; for there is a large percentage of our vast population who, for some reason or other, prefer oil-lamps to gas-lights, principally from the mistaken notion that, light for light, oil is the cheaper, and, with the poorer classes, "cash upon delivery" is required from them. Our other rival—electricity—is also being improved and making some progress; but people have not yet much confidence in it. It is still erratic, uncertain, and very costly, and quite unfitted to be used in rooms without some means of good ventilation. It is even attended with a certain amount of danger to health, as I pointed out in my paper read at the meeting of The Gas Institute in June last year, if used in crowded rooms badly ventilated. This rival will never be able to produce a flame like the Sugg-Methven lamp, to give a light of 250 candles with a consumption of only 20 cubic feet of gas per hour, or equal to ¾d. for gas. You can see at once, from the brilliancy and whiteness in colour of the flame, that the combustion is the nearest to perfection yet attained by gas. The whole of the products of combustion being ejected direct to the outer atmosphere, no vitiation of the interior air can take place; while the small amount of heat radiated from the glass globe lends itself admirably to the thorough ventilation of any apartment, however crowded. Here we have the very essence and perfection of illumination, ventilation, and comfort at a minimum of cost quite unattainable either by oil or the electric light; and gas has such a long start ahead of either of them, that there can be no possibility of its being overtaken in the race. Assuming it possible that both of the other lights may be capable of still further improvement and cheapening, so will gas be further improved and cheapened; and there is plenty of room for all three systems of illumination. Indeed, they are all three very much wanted in this great overgrown wilderness of London, where a large increase of light is very greatly needed in all the courts and alleys, to help to overcome the present dominion of vice and crime.

It would appear that the man who caused a scare among gas shareholders some ten years ago, and who told us that in five years' time gas-works and all their belongings would be non-existent and things of the past—yes, even the great Mr. Edison—has retired from the business. In the daily papers it is stated that "Mr. Edison has recently removed to more commodious quarters at Orange, near New York, and is busily engaged in constructing a set of pocket phonographs for making a brief record. Children will be delighted to know that Mr. Edison has combined the phonograph with two dolls. One of these dolls, when a crank is turned under a purple cape at its back, repeats, with much expression, 'Twinkle, twinkle, little star,' &c." Let us hope the philosopher will find this business more profitable than the suppliers of electric light have hitherto done. Then, again, from the Paris correspondent of a daily paper I read: "If electricity be eventually adopted here as a motive power on all tram-cars, it has at least been discarded for the lighting of the streets." And we know of the recent failures at Leamington and other places.

The purveyors of the electric light in the past, and even to-day, appear to me to resemble to a certain extent a needy contractor, who puts in a low tender in the hope that something may be made out of the extras. But the largest amount of "extras" they have been able to get passed does not yield them any profit; and so they collapse, and the unfortunate shareholders come to grief, which is to be so much regretted. It has been so in the past, and may be again in the future. There has been nothing startling in regard to the electric light, nor has there been anything very new discovered in relation to its production. Some improvements have been made in the lamps; but if the price of solid fuel goes up, as it is almost certain to do, and it is also certain it can never be lower than it is at present—and fuel is the principal item of cost—in fact, fuel and excessive wear and tear may be said to be the raw material from which electricity is generated—they must come to the cheapest and best of all fuels, our coal gas. So let us wish them success; and we will do our best to cheapen our gas for them, and so provide them with a low-priced fuel to enable them to live, and perhaps in a few years' time to pay a little dividend.

Overtures to gas companies have lately been made by gentlemen from the other side of the water desiring to turn our gas light into electric light, and anxiously soliciting to be allowed to take a share of the revenue of our gas consumption; and earnest appeals have been made, like Mr. Killingworth Hedges's latest entreaties for gas companies to come to their aid, and help them to do what they cannot do for themselves. But these gentlemen do not seem to understand the conditions upon which British gas companies supply gas to the public, or to know that capital raised for the purpose of gas supply cannot be misused for supplying electric light. The only way, as far as I can see, in which we can help them will be by improving our manufacture so as to be able to lower the price of gas as much as possible, and, as before mentioned, to supply them with the best fuel at the lowest price.

This leads me to ask, having glanced at the past and the present. What of the future? First, how can we best effect more economy in the manufacture and distribution of gas, so as to supply it cheaper to the public? Secondly, what inducement, and what further facilities, can we hold out to the public to use gas; what other means can we adopt to reach the large proportion of non-consumers; and how can we further popularize its use and consumption? These appear to me to be the problems which require solution in the near future, and to which our attention should be directed. As I remarked before, we cannot expect coals to be much lower in price, nor freights much lower. Railway rates may come down a little, which will help some of us; the coal dues will undoubtedly cease to exist presently, which will be equal to about 1d. per 1000 cubic feet less in the price of gas. There cannot be much, if any, reduction in the price of lime or oxide of iron. Consequently, we cannot expect to lower the cost of purifying much less than what it is now—about ¼d. per 1000 cubic feet. Carbonizing wages cannot be much reduced, except by the use of machinery, which, wherever it is adopted, brings down this item about one-third, or to about 2d. instead of 3d. per 1000 cubic feet, or a saving of 1d. Wear and tear of 3d. per 1000 cubic feet cannot be much reduced with our present arrangements of retorts and furnaces. Leakage is about at the minimum, and cannot be expected to be very much less. Rates and taxes cost about 2d. per 1000 cubic feet, which is disproportionately high, and which the consumer has to pay for in the cost of his gas; but there is not very much likelihood of this charge being reduced. Bad debts and law and other expenses cannot be very much lower than they are now.

Then, *per contra*, How are we to increase the yield of gas per ton of coals carbonized? Is it possible to get a few thousand cubic feet of gas extra by squeezing more carbon out of the coke left in the retorts or some other form of carbonizing apparatus? I have for the last year or two had thoughts about it; and I am under the impression that it might be done, if chemists or someone else could show us how, or if it could be possible to remove the excess

of carbonic oxide above 8 or 10 per cent. from the gas without reducing the illuminating power. We might then also increase the yield of ammonia by the same means, if the carbonic oxide could by any possibility be removed without much expense. And perhaps a little more might be obtained from the tar, but probably not very much, because the tar, with its light naphthas and benzenes, has already been condensed and thrown down in the condensers and washers. The heat required to break up the very complex constituents would have to be very great indeed to prevent any gases given off from being recondensed when they reached the lower temperatures. I have tried in more ways than one to make tar give up some of its carbon; but the matter is surrounded with many difficulties, not the least being how to present to it the proper equivalent of hydrogen in a perfect condition to combine with the carbon to form permanent gases of the bicarburetted hydrogen series. I do not, therefore, think there is very much hope for any increased yield in this quarter; although there are some people still trying to do it. The Dinsmore process also is being experimented upon; but how 2500 extra cubic feet of 21-candle gas, which is said to be got from the tar from a ton of coals, is to be accounted for, requires some explanation); and there are others who seem to think they can make gas from tar who perhaps have never heard of the Everleigh process, with its large yield but at the station meter only, and of its failure, or of Messrs. Still and Lane's endeavours in this direction, which I tried for some time, but with little success. There is a similar difficulty with oils of any specific gravity. A great proportion of the gases given off will recondense in the apparatus and mains, and even in the consumers' fittings, in cold weather.

Then, can any part of gas-works plant or apparatus be improved, relieving the retorts of pressure by the use of anti-dips. For works having exhausters they answer very well with some kinds of coals and cannels; but anti-dips for small works without exhausters cannot relieve the retorts of back pressure, though there is a way of doing it. Of course, small works wish to increase their make per ton of coals, and sell gas cheaper, as well as larger ones. The retention of naphthalene in the gas by means of hot-frictional condensation tends to increase the volume as well as the illuminating power; but after this there is no other apparent means, either in washers, scrubbers, or purifiers, by which the volume of gas can be increased.

Then with regard to the second problem—the increase of sales. What can be done further? There is such a wide field here, and circumstances so alter cases, that hardly any general rule can be laid down; but gas managers are getting more alive to the matter, and are making good suggestions here and there. Experiments are being tried in more ways than one to supply gas to the million; and perhaps it should not be a matter for regret that there is such a large proportion of the public who are non-consumers. If everyone used gas as an illuminant, our yearly increasing output might suffer. We ought rather to accept it as a favourable circumstance, and by all means in our power reverse the proportion, and get the majority to become our customers. Here is an object to work for—an incentive to increased action on the part of gas companies; and as the days of cheaper gas come along, as come they will, so we shall have an ever-increasing and larger constituency to supply. Taking the experience of the past, as we have a right to do, so will it be in the future; and by a little yielding here and there (removing all the hindrances we possibly can, without losing or giving up any of the rights, powers, and safeguards which the Legislature has authorized us to employ for our security, but at the same time not straining these powers to the utmost, or insisting upon the "pound of flesh" principle, which is how *not* to popularize gas), we shall make progress.

Undoubtedly a great deal of this part of our outdoor routine rests with the representative of a gas company. An inspector may be suave, polite, courteous, and obliging, or he may be the reverse, and armed with "a little brief authority' and standing upon his supposed dignity, may, by a bumptious, high-handed manner, fail to win a customer. But nowadays the latter class of inspector is very rare. Then, as iron tubing is very cheap, the expense is not great in laying a length of extra service-pipe free of charge for lights, stove, or engines.

Meter-rents may some day be a thing of the past, or merely nominal so as to maintain a property claim in meters. Enforced deposits undoubtedly act as a hindrance to some people; but what can be suggested in their stead? When a doubtful applicant demands a supply of gas—a supply which he has a right to demand, and which we are bound by law to give him—weekly or monthly collectors for a year or two might be tried, or a prepayment meter of the description of that invented by one of our members, Mr. W. E. Price, which was shown and described by him at our last meeting, would perhaps partly meet the difficulty. It could then be said to an applicant for light: "If you object to pay a deposit, or give a security or good reference, we will fix you a prepayment meter." This arrangement might very likely suit some class of would-be consumers; but a good deal must still be left to the careful judgment of a judicious inspector and collector. I may mention that the South Metropolitan Company gave up asking for deposits from occupants of private houses last year, and have returned about £10,000 deposits to other consumers; and the last half-year's accounts show £114 less bad debts—a proof that more efficient collection of accounts is equal to, or better than deposits. A modification of the Scotch system might be tried, and a sub-inspector collector call every month, take the index, make out the account, and receive the money; a change of districts and books taking place every month, to guard against, and be a check upon errors and irregularities.

If builders could be induced to put pipes and brackets into the houses they erect, in the same way that they put in bells, and bell-pulls, and hot and cold water pipes, it would be an undoubted incentive to a tenant to use gas, and add value to the building, as the cost of introducing the pipes and fittings after the house has been built, although perhaps only a few pounds, is, in my opinion, the greatest hindrance to the extended use of gas, especially in London and South of England generally, where the conditions of house-hiring are so different from what they are in the North. Any facilities we can offer or propose to meet these different conditions ought to concern us; and we should see if and how it can be done, without at the same time extending our responsibilities beyond the delivery of the gas to the meter.

It would never do for gas companies to be held responsible for a builder's bad or leaky pipes and fittings or defective burners. Although there sometimes has been a wish expressed, and papers read about it, that it would be desirable for gas companies to have extended control to the house-fittings and burners, to my mind it would not do to saddle ourselves with so much increased responsibility, besides interfering with the army of gas-fitters and other vested interests. Whatever may be done in this direction, the outlet union of the meter must still be the limit, as at present fixed, for which we are answerable, unless the contract system I have alluded to should again come into vogue, which let us hope may never be.

The prepayment meter offers facilities to a certain class of small consumers, and ought to become popular among artizans and small householders. Even costermongers and the lower classes of the community should take advantage of procuring a much superior light at less cost than oil, if, in connection with it, some cheap arrangement of fittings could be designed for the artizan class who occupy tenements of two or three rooms. An automatic prepayment meter for two lights might be fixed over the door out of the reach of children; but so that a man or woman could put a penny into the slot, or several pennies if they had got them. From the outlet of the meter a half-inch iron bend connecting to a T-piece against the wall could be fixed, with 6 feet of ¼-inch iron pipe to go through the floor to the upstairs room, terminating in a bend and elbow, tap, and burner as used in workshops, and from the tee downwards 4 feet of pipe with a similar bend, elbows, tap, and burner to light the lower room. The whole fitting and fixing would not cost more than 5s. A property badge attached to the meter would intimate that "This meter and fittings are the property of the ——— Gas Company." In this way, the respectable poor man who likes his home can have a good light for a penny for nine or ten hours, or only a halfpenny per day, as he would not require it for more than four or five hours a night; and for this small sum he could have a good 4 feet an hour burner, yielding a light equal to 10 or 12 candles, for with gas at 2s. 3d. per 1000 cubic feet he would have 37 cubic feet of gas for his penny, giving him and his family a good light with one burner for three nights at less than half the cost of oil, and no trimming of lamps, breaking of chimneys, or bad smells. The man could then see to read his paper at home instead of going to the nearest public-house. A similar arrangement could be made applicable for three or four lights to those a little higher up the social scale; and a sub-collector would have a certain district to visit weekly and take up the money—probably in some districts it would not be policy to leave the money more than a week, and in others there might be a monthly collection.

To further popularize the use of gas, exhibitions of cooking-stoves, with lectures by ladies on the art of cooking, are very effective in familiarizing British matrons with the use of gas cooking. The last summer the South Metropolitan Gas Company held twenty exhibitions in the southern districts of London from May to August, with the result that this last year ending December, the net increase of cooking-stoves is 2192, or more than double the increase of the year 1887. At the twenty exhibitions there were 860 direct orders received; and the last three months of the year there were sold direct from the Old Kent Road offices, 257 heating stoves. In fact the public are only just awakening to the knowledge that they have in coal gas the best and cheapest, the very essence of fuel; and they are just beginning to realize the comfort, convenience, and economy of these aids to health, cleanliness, and absence from smoke. It is, therefore, not too extravagant to suggest that there should be a permanent exhibition in some central position in all towns where it is not already done, so that all who run may read, see, study, and appreciate all and every appliance of gas for lighting, cooking, heating, ventilating, and motive power. A half horse power engine would be sufficient to illustrate what can be done as a motor. There should also be a lecture on cooking once a day or week; and a place where all the new and improved burners of every maker in action, with their cost and advantages, could be seen.

It would be some acknowledgment which gas companies owe to the exertions of the manufacturers of these improved burners, lamps, stoves, and engines, and show people how economical gas really is; for there is still a lingering idea in the public mind that gas is a dear fuel. About twelve months ago, I was asked to read a paper at the Smoke Abatement Institution, in March and April. I did prepare a paper on "The Cause and Prevention of Smoke Fogs;" but for some reason or other a day has not yet

been fixed for reading it. However, there can be no harm done if I quote a short extract from it. I say: "It was also suggested by the late Sir William Siemens in referring on one occasion to the smoke pollution of London, the advisability of the gas companies supplying a kind of inferior gas composed of hydrogen and marsh gas, to which was to be added some water gas by decomposing steam in passing it through hot coke in the retorts. This gas was to be sold at 1s. per 1000 cubic feet for fuel purposes; and he said it would possess but little illuminating power, but much heat yielding power. Sir William's idea was that this gas should displace coal; in fact he said 'then all raw coals will only be seen at the colliery or at the gas-works.'" He thought that in this gaseous-fuel method of heating our houses lay the solution of the smoke abatement difficulty. I go on to point out how such a scheme is impracticable, &c., and say further: "In the ordinary illuminating gas as now supplied, there are all the elements required for both heat and light. If it is too good or too strong for heating purposes, it can be diluted with air, as in the well-known Bunsen burner, to the extent of five or six times its own volume, and then consumed in an asbestos packed grate, such as those supplied by many makers. In this manner it can be and is at present applied to a hundred and one different industrial and domestic operations; and leaves nothing to be desired in the way of efficiency, cleanliness, and economy, and the great *desideratum* of being thoroughly smokeless. Thus we have a fuel-gas at a cost equivalent to less than 6d. per 1000 cubic feet with our 16-candle lighting gas at the present price of 2s. 5d. per 1000 feet." And I may add to this, that the heating power of this fuel-gas is quite as great or greater than the fuel-gas proposed should be supplied at 1s. per 1000 cubic feet by Sir W. Siemens. Then again in this vast Metropolis, which is extending and ever increasing, seemingly without any limits or bounds to its insatiable desire, that in a few decades it shall extend from Bedford to Bristol, there have been for some time, and there are every day, springing up immense piles of artizan and industrial dwellings happily taking the place of the rotten old rookeries and slums, where there ought to be a large field for gas consumption if applied somewhat after the Scotch system—that is, with a rising service main up the common stair, having branch service-pipes on every flat, with smaller services into each suite of rooms fitted up much in the manner I have already suggested, or with brackets instead of common "ell" cocks; the company laying the services to each, but a gasfitter fitting the pipes in the rooms. Although the company may pay the fitter the 5s. or 10s. for each consumer, still the gasfitter, not the company, must be held responsible and answerable for any and all defects beyond the outlet of the meter. And in the courts and alleys of our large towns (and there are thousands of them) a service main might be laid with branch service-pipes to many thousands of the respectable poorer classes, who would greatly appreciate the blessings of a good and cheap gaslight if it were available, and if it were presented to them in the manner I have indicated. Supposing an alley or a court with a hundred families, or fifty on each side (and there are many hundreds), the expense of running 800 or 1000 feet of 2-inch service-pipe could not be great; and supposing only 60 houses at first had gas laid on, each burning 20 cubic feet of gas per night, it is only 8400 cubic feet per week, but it is 436,000 cubic feet per annum—a revenue of £54 10s. with gas at 2s. 6d. per 1000 feet.

Well, gentlemen, in conclusion, I do not see why this should not be attempted. There may be, and it is certain there will be, some difficulties to contend with; but there is the pleasure before us of overcoming any difficulties which may crop up. We run long services, and sometimes a length of main, to light a single public lamp consuming 5 feet per hour; why should we not lay the same length of service-pipe along our courts and small side streets, and pick up a few dozen consumers of the respectable poor and become "the poor man's friend," and try and win the masses to our side and bring them under the civilizing influence of a good gas light to brighten their homes and add to their comfort, and to our profit? I see no reason why this should not be tried; so there is plenty of work ready to our hand. Let us be at it, and let our aim and motto be still onward—always "Excelsior."

Mr. J. L. CHAPMAN (Harrow) said he was sure that the members were all thankful to Mr. Somerville for reading to them his interesting address—not only on what had been done, but on what they were to do in the future. He was happy to say they never went into the matter of the Presidents' addresses; but he might observe that they rejoiced to think Mr. Somerville had taken so much interest in the Association in days gone by, that he was now presiding over them, and that he was leaving them so instructive an address for further consideration during his term of office. He proposed that the cordial thanks of the meeting be passed to Mr. Somerville.

Mr. W. H. H. BROADBERRY (Tottenham) had much pleasure in seconding the motion—in fact, he thought Mr. Somerville deserved an extra vote of thanks. He had certainly devoted much thought and time to the address, and prepared it with a deal of care. There was no doubt whatever that they all saw the reasonableness of the ideas thrown out by Mr. Somerville—the feasibility of carrying them out. Their President spoke very strongly on the question of chemists and chemistry. In his (Mr. Broadberry's) opinion chemists and gas engineers would have to go hand in hand; and if they did this, it would be a long time before the prognostication came true that their gas-mains would some day be sold as old iron, and the works turned into electric light establishments.

The motion was heartily acquiesced in.

The PRESIDENT acknowledged the vote, remarking that it was always a pleasure to him to do all he could to help forward the work of the Association. If the members could pick out a few grains of what was of any good in the address, he hoped they would do so, and let the chaff go to the wind.

This closed the business of the meeting; and the members and a number of friends afterwards dined together.

SOCIETY OF ENGINEERS.

In the JOURNAL last week we briefly noticed the proceedings at the first ordinary meeting of the above Society for the present year, which took place at the Town Hall, Westminster, on the 4th inst. The most important matter was, of course, the Inaugural Address of the President (Mr. Jonathan R. Baillie, M. Inst. C.E.), some portions of which are of sufficient interest to our readers to justify a more extended reference to them than we were able to make in our issue for the 12th inst.

Mr. Baillie commenced by reviewing the work of the Society in the past year, in which connection he made special reference to the visits paid to various important works during the vacation. He pointed out the immense value of these inspections to the members, as giving them an insight into practical work, in places which would, as a rule, be closed to the general public; and he took credit to the Society for being the first to inaugurate these visits at the suggestion of Mr. Alfred Williams, the Honorary Secretary and Treasurer of the Society.

Turning to the papers read during the year, the President alluded to that on the effect of sea water on Portland cement, by Mr. Henry Faija. This paper was founded upon the failure of some concrete work at the Aberdeen graving dock; and the conclusions at which the author arrived were that sea water has no deleterious chemical action on a sound and properly used Portland cement. He therefore attributed to some other cause the failures at Aberdeen. The second paper was by Mr. W. Santo Crimp, who described the Wimbledon main drainage and sewage works. The communication, the President said, was full of information upon the subject of which it treated, and would, he thought, prove of great value to sanitary engineers engaged in such work, as a record of the method of dealing with and disposing of the sewage of a district of some 3500 acres near London. The question of the mechanical filtration of water was next brought before the members by Mr. Edward Perrett, who discussed the relative advantages of various systems, and pointed out the merits of a plan of his own, which has been applied (we believe by the Pulsometer Engineering Company, Limited) at a water-works in South America. Here the filtering medium is crushed retort coke, which is effectually cleaned by the occasional application of an upward stream of compressed air. At the works where this system is in use, 20,000 gallons of river water are filtered per hour—the area covered measuring 37 feet by 7 ft. 6 in., giving an average rate of filtration of nearly 100 gallons per square foot of filtering surface per hour. The Acton main-drainage works formed the subject of a paper read by Mr. C. Nicholson Lailey. Very special interest attached to this paper, on account of its including a description of the ferro-carbon precipitation process, which system Acton was the first town to adopt. This process consists in the precipitation of solids, and the filtration of the effluent through a bed containing a layer of magnetic spongy carbon. The magnetic carbon is stated to possess very remarkable oxidizing and aërating powers; so that the effluent is found to have a very high degree of purity imparted to it. A useful and interesting paper was contributed by Mr. H. Ross Hooper, on the "Practice of Foundry Work." Mr. Hooper selected a very wide subject, but confined himself to the details of moulding and casting, which he treated in a practical manner; concluding with some remarks upon the inspection of cast-iron work, and the tests usually applied to, and the general strength of cast iron. The final paper of the year was one by Mr. W. Worby Beaumont, on "High-Pressure Steam and Steam-Engine Efficiency." This was a theoretical examination into the advantages attending the use of high pressures in steam engineering. The author combated the supposition that the useful limit to steam pressure would be reached at about 200 lbs. or below it, and gave reasons for expecting a very large increase in available work as due to the increase of pressure up to at least 300 lbs. The President thought that no more striking comment upon the high character of the whole of the papers read during the year could be afforded than the fact that the Council had awarded a premium of books to the author of every one of them.

The President next referred again to the vacation visits, one of which was to the Barking sewage outfall works, of which a full description was given in the JOURNAL for Oct. 9 last (p. 649).

In reviewing the important engineering works of the past year, Mr. Baillie alluded first to the construction of the electric lighting station at Deptford—the largest undertaking of the kind ever attempted—as showing the progress of the movement now on foot for the establishment of central stations for the supply of the electric light in London. Particulars as to the plant and general arrangements at this station having already appeared in our columns (see JOURNAL for Nov. 6 last year), it is unnecessary to reproduce the President's figures, but simply his concluding remark in regard to this project—viz., that one cannot help wondering what will be the effect of sending into London the enormous electric current which will be emitted from the station. In addition to the Deptford undertaking, the President referred to

the other electric lighting schemes which have actually been carried out or are in progress in the Metropolis; and he attributed the marked advances which have lately been witnessed in the direction of house-to-house lighting to the passing of the Electric Lighting Act Amendment Bill. He thought the stringent clauses of the Act were very necessary, in the first instance, for preventing the creation of an injurious monopoly and the formation of bogus companies. The Amendment Bill, he considered, was a just and reasonable concession; the time having arrived when the way should be made easier for legitimate enterprise.

The remainder of the address dealt with matters which are not of special interest to our readers.

Sanitary Institute Lectures.—The Secretary of the Sanitary Institute (Mr. E. White Wallis) has issued a list of the twelve lectures to be delivered at the Parkes Museum, W., on Tuesdays and Fridays during next and the following month, for the special instruction of those who are desirous of obtaining some knowledge of the duties of sanitary officers. They are a continuation of the courses previously held, and will comprise the subjects scheduled for the examinations held by the Institute. The introductory lecture, which will be delivered on the 5th prox., will be by Dr. B. W. Richardson, L.L.D., F.R.S., will deal with the general history, principles, and methods of hygiene; and it will be followed, on the 12th, by one on water supply by Dr. L. Parkes. The remaining lectures will embrace the subjects of ventilation, drainage, sanitary appliances, and sanitary law.

Propagation of Parasites by Bokhara Water.—The great difficulty in establishing any fixed principles in regard to the detection of micro-organisms in water received an interesting illustration in a recent article in the *Fortnightly Review*. The writer (the Hon. George N. Curzon, M.P.), in giving an account of his visit to Bokhara, dealt incidentally with the question of water supply to that famous city. Mr. Curzon found just the same state of things which prevailed when another Englishman visited Bokhara some 300 years ago. In a population which considerably exceeds 100,000, about every fifth person suffers from the presence of a worm, which is for the most part found in the leg of the individual, between the flesh and the skin. Sometimes a man is troubled with from twenty to thirty of these creatures. The worm, when extracted, is often two or three feet in length, and has the appearance of a long string of vermicelli. But the curious point is that the most minute examination of the drinking water of Bokhara under the microscope has never revealed the presence of the germ of this parasite; nor has Dr. Heyfelden—a devoted scientist, who is attached to the Russian Embassy at Bokhara—succeeded in identifying a male specimen of the creature. He is inclined to think that the female, being oviparous, pushes her way to the surface of the skin when full of young, each *reshta* when dissected being found to contain from half a millon to a million embryo worms. The embryos, if occasionally dosed with a drop of water, will live for six days. Beyond all question, the presence of this repulsive worm is due to the filthy state of some of the open pools of Bokhara. The streets abound with dirty tanks of stagnant water. The water in a tank which adjoins a mosque is considered holy, and is used for drinking as well as for washing; thereby spreading the germs of all sorts of diseases, but more especially ensuring the propagation of the parasite already described.

The Construction of Photometers.—At a recent meeting of the Berlin Physical Society, Dr. Lumner spoke on the subject of photometers, and specified the following requirements in their construction:—(1) The surfaces whose brightness of illumination is to be equalized must not be separated by even the narrowest intervening space; (2) the outline of the surfaces must be sharply defined. An ideally perfect photometer ought not to reflect any light from its grease-spot, and be impermeable to light over the rest of its surface. When a drop of Canada-balsam, whose refractive index is very nearly the same as that of the glass, is placed between the opposed hypotenuse surfaces, total reflection is done away with at the place where the drop lies; and thus by illumination from one side only either a bright spot is seen on a dark ground or a dark spot on a bright ground. When the illumination is made from both sides, equality of illumination can be easily established by adjusting the relative distances of the sources of light until the spot disappears entirely. The drop of Canada-balsam very soon loses its sharply-defined edges; hence some other mode of procedure became necessary. The central portion of the hypotenuse surface of one of the total reflection prisms was left untouched, while the rest of the surface was ground to a slightly spherical shape. When the surfaces of the prisms were now firmly pressed together, light passed without hindrance across the point of close contact of the surfaces; whereas it was totally reflected at all other points. By this means an ideally perfect "grease-spot" was obtained, which was permeable to light, but reflected none; while the surrounding area reflected light completely, and allowed none to pass through. A third method for obtaining an ideally perfect grease-spot consisted in etching figures on one of the reflecting surfaces of the prisms. The etched portions were perfectly transparent; the rest of the surface reflected light completely. The speaker exhibited photometers constructed according to the above methods, and proved theoretically that the ideally perfect grease-spot bears to the real one the ratio of 1 : 2, according to the constant determined in the Imperial Physico-Technical Institute. The sensitiveness of the new photometer is about 1 per cent.

Register of Patents.

Governing Mechanism for Gas-Engines.—M'Ghee, G., and Burt, P., of Glasgow. No. 3427; March 6, 1888. [8d.]

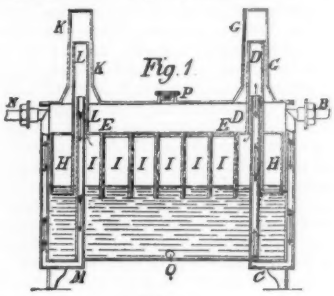
This invention relates to mechanism for governing gas-engines, and for causing the two pistons of the engines described in patent No. 14,578 of 1886 to work in unison.

The governing mechanism, under one modification, comprises a hook or cam fitted on a shaft revolving in proportion to the cycle of operations of the engine. The hook, when the engine is working at the desired speed, comes against a pin or stud fixed on a part of the supply valve-rod and opens the valve. This part of the rod is actuated by a cam against, and put into proper position by means of, an adjustable spring, which takes a given time to effect action; so that if the engine exceeds the desired speed the hook comes opposite the pin before the pin is in proper position to be actuated thereby. The hook thus revolves past the pin without actuating it; and consequently it allows the valve to remain shut during that revolution of the hook.

Under another modification, the governing mechanism comprises two cams fitted on a shaft as before—one cam being for pushing a roller or catch fitted on a stud capable of transverse motion against an adjustable spring on the valve-rod; the other one being for actuating the roller and consequently the valve-rod. At the desired speed of the engine, the spring adjusts the roller into proper position just in time to be actuated by the second cam; but should the engine exceed the desired speed, the second cam will have revolved past the edge of the roller before the spring puts it into proper position; so that the rod is not actuated during that revolution of the second cam, and the supply-valve consequently remains shut.

Carburetters.—Seagrave, G., and Olivier, P. A., of Lime Street, London. No, 3538; March 7, 1888. [8d.]

This carburetting apparatus is composed of an outer vessel as a hydrocarbon container, and of an inner buoyant vessel provided with baffle-plates on the interior, covered (or partially so) with flannel or absorbent material and with each baffle-plate alternately stopped to form zig-zag passages for the gas or air to impinge upon the saturated material so as to become enriched; this being enhanced by contact with loose threads hanging across the passages as curtains.



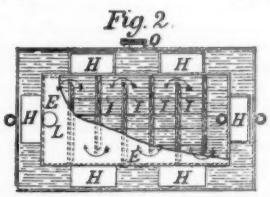


Fig. 1 is a longitudinal vertical section; and fig. 2 a plan, with the cover removed and with part of the inner vessel broken away to show the baffle-plates more clearly, and the zig-zag direction which the gas or air has to travel to become impregnated with the hydrocarbon on its way to the outlet.

The outer vessel is of rectangular shape, and the gas inlet branch B leads into a tube D fitted on the top of the inner vessel E, the upper end of which is closed. The cover to the apparatus is hermetically closed; and a tube G on the cover is also closed at its upper end. The vessel E is provided with air-tight compartments H, or an air-tight belt, to enable it to float in the hydrocarbon liquid, and always maintain a liquid-tight joint by immersion. I are baffle-plates, arranged from each side alternately, leaving a clearance for the passage of gas or air as it travels through the apparatus. The plates are covered on both sides with absorbing material, the lower ends of which hang therefrom and act as feeders to the whole of the material. There are also loose thread curtains dipping in the liquid hydrocarbon, and hanging across the zig-zag passages, to break up the gas. K is another pipe closed at top, and serving (in conjunction with the tube G) as a guide for the rising or falling of the tube D and also of L—the tube L, like D, being closed at top, so that the impregnated or enriched gas, as it leaves the last of the baffle-plates, passes up the space between the tube L, and so on to the outlet N, and from thence to the burners. P is a screw plug hermetically covering the feeding-pipe; and Q a screw plug similarly covering the pipe provided for emptying the vessel.

Retort-Feeding Appliances.—Dempster, R. and J., of Newton Heath, Manchester. No. 3566; March 8, 1888. [11d.]

This invention consists of further improvements in, or additions to, a former invention—No. 16,582 of 1887.*

In the former invention the coal to be distilled was fed into the retorts by means of pistons or rams pushed forward and withdrawn at intervals by means of racks and pinions actuated by apparatus which

* An illustrated description of this invention appeared in the Journal for Nov. 20 last year, p. 996.

received motion from a prime mover. The present invention, however, relates more particularly to the cases in which the retorts are arranged in tiers as in large gas-works, where the retorts are mounted at three, four, or more different heights above the furnace. In such cases it is proposed to work the retorts in vertical series; and for this purpose to connect the rack-pinion shafts of each series with apparatus which receives motion from a revolving or rocking shaft. In some cases two contiguous retorts on the same level are coupled together; so that, taking for example a case wherein the retorts would be set five high, ten retorts would constitute a series. A to-and-fro rocking or rotary movement is imparted to each rack-pinion shaft at intervals, by means of apparatus which receives motion from the overhead shaft. In one arrangement two ratchet wheels are fixed upon the rack-pinion shaft; the teeth of one wheel being reversed as compared with the teeth of the other. A vibrating arm carries two pawls which can be thrown into action alternately by means of a trip motion, worked by an endless chain, rope, or band, or a vertical shaft or reciprocation rod. When employing an endless chain, a trip-finger upon the chain sets in motion the feed apparatus of the retorts in succession; so that the pairs of retorts in the series are fed at regular intervals. The vibrating arms upon the rack-pinion shafts in the series may be connected together by links, and receive motion from a lever which is upon the overhead rocking shaft, or is worked by a crank or cam upon the overhead revolving shaft, or the links may be directly acted upon by the crank or cam.

Regenerative Gas-Lamps.—Brown, A. O., of Glasgow. No. 3838; March 13, 1888. [8d.]

Fig. 1 is a vertical section of a regenerative gas-lamp to which these improvements are applied; and fig. 2 is a vertical section of the burner air-conducting tube (to an enlarged scale) used in conjunction with the lamp.

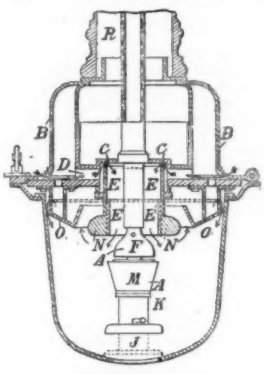


Fig. 1.

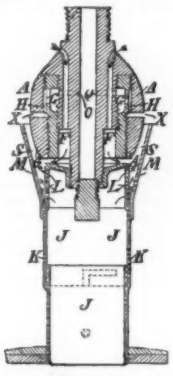


Fig. 2.

In carrying the invention into practice, a central vertical pipe (as ordinarily employed in regenerative lamps) supplies the burner A with gas, and forms the means of suspending the lamp from the ceiling. Above the burner and beneath the dome-shaped casing B, air is led from the outside of the lamp into a hot-air chamber C, through radial air passages or tubes, whence it is caused to traverse over the outer casing E, of the hot-air chamber on its way to the flame. These tubes and the cylindrical casing E, becoming highly heated by the combustion of the lamp together with the waste heat, impart a high degree of temperature to the air passing through and along the before-mentioned air ducts or passages. The air so heated in its passage is further led down the air passages or tubes F, formed in the top of the burner, and so heats the gas and increases its volume and illuminating power as it issues through small holes or passages into the wide annular space G. After the gas has become so heated, it finally issues (under pressure) through jet perforations into the narrow annular space H, and out at the opening X to be burnt. Cold air enters the bottom exterior of the lamp through a hole in the globe, and ascends the space J, formed by the tubular casing K, where it also becomes heated and in its ascent becomes divided or broken up into a great number of currents as it emerges through a series of perforations L, in the top of the tubular casing, where it commingles with the down-flowing heated currents of air through the burner at S. Both currents of heated air, after having so commingled, become of one uniform temperature, and are finally directed to the flame by a conical sleeve M. At a suitable distance above the flame a ring or washer N, semi-elliptic in section, made of refractory material is suspended from a metallic flange formed upon the cylindrical casing E^1. Above this ring and enclosing it, is another conical ring O, also constructed of refractory material; and upon these rings the flame impinges, heating them to an intense whiteness. In the tubular casing is an inner tube so constructed as to slide up and down within the casing. Its range is determined by a stud; and this secures it in its uppermost position, working in a bayonet joint, as seen in fig. 1. The object of this is to facilitate the lighting of the lamp without opening the globe, as has hitherto been the case in such lamps. In the normal position of the casing or tube K, it rests with its flanged end upon the glass of the globe, preventing any ingress of air except by the passage J.

Indicating the Extent to which Gasholders are Charged.—Wright, L. T., (late of) Nottingham. No. 3992; March 14, 1888. [8d.]

This invention relates to means for automatically indicating the extent to which a gasholder is raised, and thereby enabling the volume of gas contained in it to be ascertained.

With this object, there is mounted upon the top of the holder a small reservoir containing water, glycerine, oil, spirit, or other suitable liquid. From the lower part of the reservoir, a pipe extends to the ground level, and thence to a Bourdon or other pressure-gauge placed convenient for inspection. The pipe is maintained charged with liquid from the reservoir; and as the holder rises, it lifts a corresponding length of the pipe or extends the zig-zag connection, thereby forming a hydrostatic column, the pressure whereof is communicated to the gauge and indicated. Instead of placing the reservoir upon the holder and leading the pipe direct to the ground, the pipe may lead from a small vessel suspended by means of a wire rope or other flexible connection; the latter passing over a sheave mounted upon one of the standards, or upon the intermediate framing, and being connected to the top of the holder. According to this arrangement, as the holder is raised, the liquid vessel is lowered, and the hydrostatic column is correspondingly diminished; the gauge-dial being marked to suit this reverse method of indicating. If preferred, the flexible connection may be arranged to work over a compound system of pulleys; the total rise and fall of the liquid vessel being, under such circumstances, reduced to one-half, one-third, or other proportional part of the total vertical movement of the holder. Where the holder is supported between hollow standards, the patentee points out that the liquid vessel and pipe may be arranged to work within one of the standards.

Turning on and off and Regulating the Supply of Gas to Stoves.—Bailey, J, of Bolton. No. 7441; May 19, 1888. [8d.]

The object of this invention is to provide means whereby the supply of gas for lighting and other purposes—such as to gas stoves, ovens, &c., —can be regulated by simply moving the swivel or gas-pipe attached to a taper plug in one or other direction. The socket receiving the plug is provided with a taper or angular recess, over or round which a passage in the plug passes by the swivelling action of the gas-pipe connected to the plug. The hole in the plug can be moved from full open to the least possible amount of opening between itself and the recess so as to allow of a minimum light; the latter being determined by an adjustable stop attached to the socket or otherwise in any convenient manner. The adjustable stop is constructed to allow of the taper plug being swivelled to extinguish the light.

Shutting off Water from Supply-Pipes and Preventing Impurities Flowing from a Cistern into the Service-Pipe.—Cosgreave, J., of Kensington, W., and Morey, L., of Battersea, S.W. No. 16,064; Nov. 6, 1888. [6d.]

The object of this invention is to at any time shut off water from service-pipes, and also to prevent sediment and other impurities passing from the cistern into the service-pipe; and (if desired) it may be provided with filtering apparatus. The invention is specially applicable for service-pipes upon which valve-taps are fitted, in which case it is further designed to prevent the rumbling sound occasioned by the air when the valve-taps are shut off. The invention is arranged to stand vertically within a cistern, and is affixed to the service-pipe by means of a tube with a conical shaped and screw-threaded end or otherwise for the purpose. The tube is in communication with a perforated globular chamber, the upper end of which connects with a second tube open at the top to allow the escape of air, and protected by a cap over the vent to keep out dust.

APPLICATIONS FOR LETTERS PATENT.

1472.—Tilley, M. H., "Improvements in or connected with gas or oil stoves for heating or cooking purposes." Jan. 28.

1477.—Richardson, A., "A stop-cock or tap for water, gas, or other purposes." Jan. 28.

1508.—Green, L. H., "Improvements in or applicable to gas retorts and ovens." Jan. 28.

1831.—Thompson, W. P., "Improvements in distributing slide valves for motors or apparatus worked by the pressure of water, steam, air, gas, or other fluids." A communication from P. Caillard and V. Caillard. Feb. 1.

1843.—Crooke, W. T., "Improvements in gas-cooking stoves." Feb. 1.

1846.—Boggett, W., "Improvements in the application of heat produced from liquid hydro-carbon and waterburners to the production of light and electricity, and in apparatus for this purpose." Feb. 1.

1912.—Lake, H. H., "An improved gas-engine." A communication from O. Madsen. Feb. 2.

1934.—Higson, T., "Improvements in and relating to gas-taps." Feb. 4.

1955.—Wells, W., "An improved form of burner for converting oils or spirits into vapour or gas to obtain light or heat." Feb. 4.

1957.—Peebles, D. B., "Improvements in gas motors." Feb. 4.

2051.—Lenzberg, L. and M. M., "Improvements in gas-burners." Feb. 5.

2054.—Porter, G., "Improvements in and relating to regenerative gas lamps or lanterns." Feb. 5.

2118.—Taylor, W., "Improvements connected with or applicable to illuminating gas-burners." Feb. 6.

2119.—Gordon, W., "Improvements in or connected with regenerative gas or vapour lamps." Feb. 6.

2127.—Etherington, J., "Detecting the leakage of water, gas, or any liquid in main pipes underground without uncovering same, and called a 'Phonographonata.'" Feb. 6.

2144.—Piers, Sir E. F., Bart., "The application of gas and petroleum engines to locomotive and other work." Feb. 6.

2162.—Richards, W., "Improvements in the mechanism of automatic prepayment meters." Feb. 6.

2193-4-5.—Gordon, W., "Improvements in or connected with regenerative gas or vapour lamps." Feb. 7.

2210.—Shaw, J. F. and R. H., "Improvements in gas and other explosive engines." Feb. 7.

2246.—Lloyd, G. H. and A. L., Bewlay, H., and Sutherland, W. S., "Improvements in producing water gas, and in apparatus therefor." Feb. 8.

2251.—Valon, W. A. M., "Improvements in the indices of prepayment gas-meters." Feb. 8.

2265.—Gordon, W., "Improvements in or connected with gas or vapour lamps." Feb. 8.

2269.—Bridewell, R. F., "An improved automatic gas lighting and extinguishing apparatus." Feb. 8.

2280.—Williams, J., "Improvements in or appertaining to the control of the supply of gas or other fluids in buildings, factories, or the like." Feb. 8.

Correspondence.

[*We are not responsible for the opinions expressed by Correspondents.*]

OIL LIGHTING AT ERITH AND WIMBLEDON.

SIR,—My mild and legitimate criticism in the JOURNAL for the 22nd ult. has, it appears, hit oil public lighting very hard, as the purveyors of oil dispute my facts. However, they cannot upset the fact of the official statement that 106 but of a total of 280 oil-lamps in the Erith district were not alight (or went out) within a few months of the existence of their contract. How many smoked and were next to useless does not appear to have been officially reported. They cannot upset the fact that there was *sworn evidence* at the Woolwich Police Court, last week (*vide* the *Erith Times*) that "The lamps were lit by a new system and were *meeting with a good deal of opposition*." Neither can they upset the evidence of my own obtaining. I have seen the smoky lamps —the glass as black as your hat; and upon two occasions, when casually visiting Erith, I have seen the lamp close to the Local Board's own office —at an important junction passed by the cabs from the railway station —in its "*expiring* moments" *twice*. If this has happened on casual visits, may I not legitimately question whether it has always behaved properly when I have not been there? Yesterday afternoon, at four o'clock, one of the Defries oil-lamps in West Street was smoking furiously. As it was raining hard at the time, it was "too much of a good thing" to wait to see the lantern become perfectly black and then collapse.

As to Wimbledon, I may just say we had a contested election again here, for the County Council, on Saturday last; and whilst the voters were waiting for the result, two of the "Mitrailleuse" lamps expired between the Committee-room and the successful candidate's residence. Last evening, about 8.30, another oil-lamp collapsed within 100 yards of my front door. A policeman was passing at the time, and I inquired of him whether that was a Wimbledon public lamp. During the week the oil-lamp at the door of Mr. Eley's large drapery establishment at the corner of the Worple Road was *in flames*. I give particulars because the advocates of oil-lamps dispute my facts. What is success, if this is successful lighting?

My advice to Local Boards with an "itch" for oil-lamps is:

"Better bear the ills ye have
Than fly to others that ye know not of."

Wimbledon, Feb. 15, 1889. R. P. KEYS.

THE GAS INSTITUTE.

SIR,—In the many letters that have appeared in the JOURNAL from time to time respecting the present position of The Gas Institute, and the course which the Council now ought to pursue, the legal bearing of the question as to what the Council as at present constituted have the power to do, seems to have been entirely lost sight of. A few words upon that point may, therefore, not be altogether thrown away.

When an institution has formally adopted certain rules for its own government, it must, as a matter of course, conform to those rules in the same way as it would have to do with an Act of Parliament; and any attempt, on the part of the management, to go beyond those rules may, at the instance of any single subscriber, be peremptorily stopped by taking the proper course. The Council, therefore, cannot act just as they please, or do what they think necessary, unless it comes within their own established regulations.

The rules of the Institute provide as follows:—

The affairs of the Institute shall be managed by a Council, subject to the control of the general meetings.

The Council shall consist of a President, three Vice-Presidents, twelve ordinary members, three members of Finance Committee, and three Trustees. Each Past-President shall also be *ex officio* members of Council for a period of two years from the date of his retirement from the office of President. Five to form a quorum.

The President, Vice-Presidents, Finance Committee, and Auditors shall be elected annually, at the annual general meeting.

The rules do not give power to the Council to fill up any vacancies that may arise from death, resignation, or otherwise, or to have a special general meeting for that purpose; so elections can only take place at the annual general meeting.

The Finance Committee are specially appointed to do certain things—make all payments, sign all cheques, &c.—quite independently of the general Council, who have no power to interfere with their proceedings either to fill up vacancies as they arise, or transfer the duties delegated to them by the general meetings to other persons. The Trustees are also specially appointed to do certain things; and the general Council have no power over them. It is probable that if the general Council had all been composed of ordinary members, each member having identically the same powers, a quorum might have been able to exercise all the powers of the Institute by itself for a time; but it is impossible to entertain such an opinion with respect to a Council constituted as this was, as that would, in effect, be giving larger powers to the quorum than the Council when fully constituted possessed themselves. All the special and ordinary members of the Council were appointed in due course at the last annual general meeting, and undertook their respective duties. But since then all the special members, together with some of the ordinary members, have resigned their appointments and withdrawn from the Council; so that there are now only a few ordinary members remaining in the Council, and these, being sufficient to form a quorum, have appointed another Finance Committee.

Taking all these matters into consideration, it is very doubtful whether the Finance Committee, as at present constituted, would be justified in signing cheques, or whether the Trustees, having resigned their offices, and thereby ceased to be Trustees, would be justified in transferring the property now vested in their names into any other names, unless they were appointed in strict accordance with the rules under which they were themselves appointed. Unless all classes will consent to act harmoniously, and pull together again, there will be no other course open than to wind up so as to apportion the funds, and start again in another direction. In any event, as the present rules are very defective in themselves, and wholly unsuitable for an Association constituted as this must of necessity be, they ought to be thrown aside, and others substituted more suitable to the purpose.

All the irregularities that have recently occurred might easily have been avoided if the rules had been properly framed in the first instance. When an objection is taken to any subject not on the *agenda* being introduced, the proper course is to have it decided at once, without discussion, by a show of hands. The members present at any general meeting (many of whom may have come from long distances to discuss a particular subject) are surely entitled to decide whether they will permit their time to be occupied in discussing another subject, in which they may have no interest. If, after an adverse decision on the show of hands, any member tries again to introduce the subject, the Council should have the power absolutely to refuse receiving any further subscriptions from him; and thereupon he would cease to be a member, and no further proceedings be necessary. The knowledge that the Committee possessed this power would be quite sufficient to prevent all irregularities; and it would never be necessary to exercise the power.

Westminster, Feb. 16, 1889. WM. LIVESEY.

GAS-MAINS AS ELECTRICAL CONDUITS.—A correspondent, writing in reference to the claim put forward by Mr. P. H. Wilkinson, of Harrogate, in the last issue of the JOURNAL, to priority in the use of gas-mains as electrical conduits, call attention to the fact that in the transactions of the British Association of Gas Managers for the year 1873 (the Edinburgh meeting), the then President, the late Mr. A. A. Croll, in his Inaugural Address, gave an interesting account of the expeditious laying of mains, and also of the laying of a telegraph wire through a portion of them. As this took place some years prior to the meeting, our correspondent is under the impression that the credit must be given to Mr. Croll, if any is due, for the first use of a gas-main for the purpose mentioned.

GAS EXPLOSION AT SALFORD.—A gas explosion occurred at about six o'clock on Monday night last week in Soho Street, off Ordsall Lane, Salford. It is believed to have been caused by a leakage from the gas-main arising from a subsidence. The houses in the locality are built upon "tip" or filled-up land. They are without cellars, but have a space beneath the ground flooring so as to keep them dry. It is thought that gas escaping from the main, and unable to percolate through the pavement, collected in this space, and rising through the floor, was ignited by an oil-lamp. A fire followed, but was rapidly extinguished by the Salford Fire Brigade. The explosion, however, blew out the front of No. 20, and greatly damaged the partition walls which divide it from the houses next door. Three of the inmates of No. 20 were injured, and one person in No. 18; but no fatal results ensued.

CAGLIARI GAS AND WATER COMPANY, LIMITED.—At the annual general meeting of this Company which is appointed to be held to-day, the Directors will recomend a dividend at the rate of 8 per cent. per annum for the past half year; making with the interm dividend at the rate of 6 per cent. per annum for the six months ending June last, a total of 7 per cent. for the year. These payments will only absorb £10,500 out of the £16,949 available for division; and therefore the Directors recommend that in addition to the dividend, a bonus of 5s. per share be paid. This will require £1875, and leave a net balance of £4574 to be carried forward. The receipts for the past year were £21,626; the expenditure, £9582. After the usual deductions for the sinking and reserve funds, and placing an additional £1000 to the special reserve fund, the net revenue for the year was £12,044. There was an increase of £279 in the receipts for gas, and of £140 in those for water. The gas unaccounted for amounted to only 3½ per cent. of the make over the year.

SALES OF SHARES.—On Wednesday, the 6th inst., Messrs. Buckland and Sons sold by auction, at Windsor, 113 shares in the *Windsor Royal Gas Company*. The first lots offered were 49 original £20 shares, which fetched from £43 to £43 10s. each. Next, 49 preference shares of £8 each were put up; the highest price reached being £10 15s. per share. Some new £20 shares sold for £30 10s. to £31 apiece. All the shares were sold *cum div.*——Last Wednesday, Mr. A. Aldridge sold by auction 20 original (£10) shares in the *Horsham Gas Company, Limited*; 17 *cum div.* and 3 *ex div.* The former fetched prices ranging from £18 2s. 6d. to £19 17s. 6d. each; and the latter were sold for £19 2s. 6d. each.—— Last Thursday, Messrs. Suddarts and Stansfield sold by auction, at Bradford, a large number of local shares and stocks. £1000 new ordinary stock (7 per cent.) in the *Shipley Gas Company* sold at £156 per cent. Fourteen "A" shares in the *Clayton, Allerton, and Thornton Gas Company* sold at £18 per share. Some "A" shares in the *Eccleshill Gas Company* fetched £18 5s. per share; a few "B" shares in the same Company, £14 10s. each; and three "C" shares, £13 10s. per share. Forty-five shares in the *Mirfield Gas Company* were put up; ten being sold at £13 2s. 6d., and 35 at £13. Of fifty-five original shares in the *Clayton, Allerton, and Thornton Gas Company*, thirty were sold at £19 5s., and twenty-five at £19 4s. 6d. per share. Some "A" shares in the same Company sold at £17 10s., and some "B" shares at £8 5s. per share. Four shares in the *Selby Gas Company* were sold at £50 each.

THE PUBLIC LIGHTING OF PARIS.—At the sitting of the Paris Municipal Council on the last day of the past year, M. Paul Brousse brought forward the budget for the lighting of the city in the current twelve months. He explained that three systems of illumination are employed in the public thoroughfares—gas, the electric light, and oil. The first-named illuminant is employed to the extent of 92·5 per cent.; the second 6 per cent.; and the last 1·5 per cent. M. Brousse expressed the opinion that the proportions between the first and second systems would be much changed in the future, and that electric lighting would have to be provided for to a large extent in succeeding budgets. Coming to his figures, he remarked that the gas and oil lighting cost 4,035,490 frs. in 1887; and 4,135,553 frs. in 1888; and it was proposed to expend 4,199,100 frs. in the current year. He thought this addition would be justified; and hinted that it might be necessary to ask for a supplementary vote. The estimate for the repair and maintenance of the public lamps was 1,114,500 frs. As to the electric light, this system cost 97,500 frs. in 1887; and a like amount was reckoned for 1888. This figure was therefore submitted for the current year. All the estimates were agreed to. Propositions were laid before the Council for improving the lighting; and 50,000 frs. were at once voted on account of gas. It being considered advisable that, in view of the influx of visitors which might be expected during the period of the Exhibition, a portion of the line of boulevards should be illuminated by the electric arc lamps, a credit of 200,000 frs. was asked for the purpose; and the Administration were requested to submit a lighting project to the Council with the least possible delay.

Legal Intelligence.

SOUTHWARK POLICE COURT.—WEDNESDAY, FEB. 13.
(*Before Mr.* WYNDHAM SLADE.)

THE METROPOLITAN BOARD OF WORKS *v.* THE SOUTH METROPOLITAN GAS COMPANY.

CONVICTION FOR SUPPLYING GAS BELOW STANDARD ILLUMINATING POWER.

To-day the South Metropolitan Gas Company were summoned for having supplied gas, on Dec. 5 and 10 last year, at the testing-place, 99, Blackfriars Road, of less illuminating power than it ought to have been under the Company's Special Act of 1876, by which they became liable to the forfeiture prescribed by The Gaslight and Coke and other Companies' Act of 1880.

Mr. C. A. ROBERTS appeared for the Metropolitan Board of Works; Mr. BESLEY for the Company.

Mr. ROBERTS, in opening the case, said that there were two summonses for the recovery of forfeitures incurred by the Company in respect of the supply, on two days in December last, of gas of less illuminating power than it should have been. The two Acts under which the summonses were taken out were the Company's Act of 1876, and a subsequent Act of 1880. The 26th section of the 1876 Act stipulated that the gas should be equal in intensity to 16 sperm candles. Having referred to the sections of the Act under which the Gas Referees are invested with power to appoint stations, apparatus, &c., for testing; to those giving the control of the testing-places to the Metropolitan Board of Works; and to the 40th section, which provides that there should be a Chief Gas Examiner, he went on to cite various sections in the Act of 1880 governing the case. One very important section as far as these proceedings were concerned was the 12th, which is as follows:—"If the Company think themselves aggrieved by any report of the Gas Examiner, they may, within seven days after the day on which the report is delivered to the Company, appeal to the Chief Examiner whose decision, after hearing the parties, shall be final and conclusive." For his purpose, he (Mr. Roberts) wished to lay great stress upon the expression that the report of the Chief Gas Examiner should be "final and conclusive." Section 14 provided the amount of the forfeiture. The forfeiture incurred in this case was 40*s.* for each offence. In both instances the deficiency had been less than a candle; but more than ½ candle. The 18th section also referred to the report of the Chief Gas Examiner, which, it stated, was to be "conclusive evidence of the liability of the Company . . . . . to a forfeiture." He submitted that there had been a forfeiture incurred; that the amount was provided by Act of Parliament; that there was the means of appeal provided; and that the decision of the Chief Gas Examiner should be final and conclusive. He further submitted that his Worship had not the power to go into the merits of these proceedings. With all respect to his Worship, he asked him: "How could you, Sir, decide technical questions, requiring scientific knowledge of the highest order, in your position as Magistrate?"

Mr. SLADE: That is the last thing I should like to do. I should abide by the Act of Parliament.

Mr. ROBERTS said he would call one of the assistants of the Chief Gas Examiner who would prove the report he should put in. Perhaps he should first mention that the Gas Examiner made returns giving the results of his testings. On Dec. 5 he made a report which was to the effect that the gas supplied at the Blackfriars testing-station, instead of being of 16-candle power, was 15·4 candles.

Mr. BESLEY here objected to both summonses being taken together.

Mr. ROBERTS said that the report dealt with both cases; but as Mr. Besley objected, he would take one at a time. In the case of the summons relating to Dec. 5, the Company appealed. The Chief Gas Examiner invited evidence; and after considering statements given on both sides, he gave his report.

Mr. BESLEY remarked that Mr. Roberts had been very emphatic on the words contained in the 12th section of the Act. In this case they could not make the report "final and conclusive," because the Chief Gas Examiner did not hear the parties. His friend did not notice the words "after *hearing* the parties." The authorities seemed to think there was nothing in the Act of Parliament for them to observe.

Mr. ROBERTS: I think I mentioned that the Chief Examiner, after "inviting" evidence, gave his decision.

Mr. BESLEY: He wrote some letters; but he never heard the parties. It is not an appeal unless you hear people.

Mr. ROBERTS said he would put it that the Chief Examiner invited evidence; and after satisfying himself, he made his report. This report dealt at length with the statements made on both sides; and his conclusion was: "I consider that the returns from the Blackfriars Road testing-station for deficient illuminating power, on Dec. 5, must be accepted." The report also referred to the summons for Dec. 10. On that day a return was made by the Gas Examiner, showing a similar deficiency of illuminating power. The Company appealed against the return; and Professor Williamson dealt with the two cases at once. He would produce the report, and also the return for Dec. 10.

Mr. BESLEY observed that it was impossible this could be evidence. The statute declared that there were to be a number of days after the report of the Gas Examiner, for which the appeal might lie. They had to reckon seven days from Dec. 5, and another seven days from Dec. 10; and the Chief Gas Examiner must give separate decisions for Dec. 5 and Dec. 10. He had not heard a single witness; and he had tried to throw together his report of the two cases.

Mr. ROBERTS: The Chief Gas Examiner is a statutory officer.

Mr. BESLEY: That does not give him the right to over-ride the law.

Mr. ROBERTS remarked that the duty of the Metropolitan Board was to simply administer the Act; and as to any objection raised on the manner in which the other authorities dealt with the Act, they had no control over them. He did not think the Magistrate would hold that the objection was a valid one. There was nothing to prevent the Chief Gas Examiner including any number of cases in one report. He was reminded that this was a constant practice, and had been done often before. When he said "often," he referred to cases where appeals had been made on two returns; and they had been included in one report.

Mr. *Cruikshanks*, examined by Mr. ROBERTS, said he was Secretary to Professor Williamson. He received the two documents [handed to him] from Professor Williamson.

Mr. BESLEY: Looking at Professor Williamson's writing does not make it legal evidence. He must object to these documents.

Mr. ROBERTS: One is the Examiner's return; and the other the notes of appeal from the Company.

Mr. BESLEY still objected to the documents being proper evidence.

Mr. ROBERTS said the Chief Gas Examiner was present; and the documents were produced by the Secretary to that gentleman. One of the papers was from the Secretary of the Gas Company.

Mr. BESLEY: If you will show me anything coming from the Gas Company, I will not put you to any trouble about it.

Mr. ROBERTS read the letter from the Secretary of the Gas Company (Mr. Frank Bush), in which he said he had to appeal against the return of alleged deficiency of illuminating power of 15·4 candles at the Blackfriars Road testing-station on Dec. 5. The Engineer, he added, would send full particulars. This was addressed to Dr. Williamson.

Mr. BESLEY remarked that he understood Dr. Williamson was present and he should like to have him in the witness-box.

Mr. ROBERTS said he should like to point out that Dr. Williamson was not there as his witness. It was intended that Mr. Cruikshanks should prove his signature to the report; and he (Mr. Roberts) wished to put the report in.

Mr. SLADE: I understand the best evidence is here; and it ought to be produced.

Mr. ROBERTS: It puts me in an awkward position. Dr. Williamson is here, and objects to give evidence.

After consultation with Dr. Williamson,

Mr. ROBERTS said that under stress he would call Dr. Williamson, but only to prove the signature, and not for the merits of the case to be gone into.

Dr. *Williamson* asked to be permitted to say that as he appeared there in an anomalous capacity—not as acting for either party, but as one who had been appointed officially as a judge between them—he had felt it his duty, as Mr. Slade was aware, to protest against him (Dr. Williamson) being subpœnaed under conditions which would render his evidence a distinct breach of the Act——

Mr. SLADE: I do not think we can hear that.

Dr. *Williamson*, examined by Mr. ROBERTS, proved receiving the returns in question; but he could not, from looking at the document handed him, say that it was one of the 22 he received on that particular day. The proof of that being a valid return was the signature of the Gas Examiner of the Metropolitan Board. He did receive an appeal from the Company.

Mr. ROBERTS: In consequence of that, did you make a report?

Mr. BESLEY: Did he hear the parties?

Witness: I shall decline to answer any questions bearing on my report. I made the report now produced. I considered that the return from the Blackfriars Road testing-station, showing deficient illuminating power on Dec. 5, must be accepted.

Mr. BESLEY: Did any proper person on behalf of the Company appear before you and speak to you orally.

Witness: I must ask your permission, Sir, to state grounds on which I am bound to carry out——

Mr. BESLEY: I respect your scientific knowledge very much, Dr. Williamson; but as to your knowledge of law, you are not a lawyer.

Witness: The law under which I am bound is known to me.

Mr. BESLEY: Did you have any verbal communication from the Company?

Witness: I decline to answer.

Mr. BESLEY: If the Company asked to speak to you verbally, would you hear them?

Witness: Of course I would.

Mr. BESLEY: They did not ask; and you did not hear evidence.

Witness observed that he had been misunderstood. He had had statements of evidence—written evidence.

Mr. BESLEY: Has your practice been to receive written letters?

Witness: I always receive such evidence as the parties will give me—in writing or in any way they like.

Mr. BESLEY: Your position ought to teach you not to deal with me in this way. Do you make it your practice to receive written communications?

Witness: You know the answer, because I have told you.

Mr. BESLEY: Did you see anyone in regard to this return of Dec. 5?

Witness: You have no right to ask me.

Mr. SLADE: The Act says that the decision shall be "after hearing the parties." I cannot make any decision upon this case myself unless I know whether or not the parties were heard. I will not ask whether they were heard verbally; but I should like to know whether an opportunity was given to them of expressing a wish to be heard.

Witness: Without a single exception, I have given the two parties the opportunity of saying whether they would like to be heard.

Mr. BESLEY asked that a note should be made of the objection that one report could not be made applicable to two offences. The document was undoubtedly not in compliance with the statute; and he could give evidence to show that the parties were not heard.

Mr. ROBERTS then read the report of Professor Williamson addressed to the Clerk of the Metropolitan Board. It was as follows:—

Haslemere, Jan. 4, 1889.

To the Clerk, Metropolitan Board of Works.

Sir,—I have to report that the South Metropolitan Gas Company appealed against the returns from the Blackfriars Road testing-station for deficient illuminating power on the 5th and 10th of December. In support of the appeal, it is stated by the Chief Engineer of the Company that the photometer at the Blackfriars Road station is not a correct instrument, and that the Gas Referees have given their permission to alter it. It is also stated that a photometer used by an officer of the Company, in a room adjoining the official testing-room, gave considerable higher tests of illuminating power on the days of the low official tests. It is also urged in support of the contention that the photometer is faulty, that ever since its erection, it gave tests which did not correspond to the variations of quality in the gas sent out from the Company's works—sometimes giving a low return for a high quality of gas and *vice versâ*.

The Superintending Gas Examiner of the Metropolitan Board refers to the contention that the photometer is not a correct instrument solely to say that that is not a matter with which the officers of the Board have to deal; it being solely a question for the Gas Referees. He states that the experiments made by the Company on a photometer in an adjoining room "were made with a closed Evans photometer"—an instrument which invariably gives higher results than any other pattern.

The Gas Referees, to whom I referred the statements of the Company's Chief Engineer relating to the official photometer, have thereupon furnished me with copies of two letters relating to this subject which they had written to the Chief Engineer. The letters are as follows:—

"17, *Buckingham Street, Adelphi, W.C., July* 16, 1888.

"Frank Livesey, Esq.,
"South Metropolitan Gas Company, Old Kent Road, S.E.

"Dear Sir,—In consequence of the representation made to us in your letter of April 19, we visited the testing-place in Blackfriars Road, and made an examination both of the photometer which we had certified for use in that testing-place and of the photometer in the same building which is used by your representative. A set of testings made by us with each photometer gave results which were not widely different; but this degree of concordance may have been due to a variation in the light of the candles, and we accept your statement that your photometer almost constantly gives quite a candle better in illuminating power than the official photometer. The difference in the height of the flames in the two photometers was not observable. In the box photometer used by your Company, the flame of the Argand burner danced up and down with such rapidity that its height could not be estimated. In the official 'tower' photometer, in which the air supply is steady and abundant, the flame was quiet and had about the ordinary height of 3 inches. After a careful examination of this latter photometer, we could find nothing wrong in it, nor did you point out anything that was wrong. On the other hand, the photometer which your Company has set up cannot fail on the average to give erroneous results. In addition to the defective air supply,

which is the common evil of all box photometers, this instrument is unprovided with the perforated diaphragms which are necessary to protect the disc of the photometer from reflected light. We believe, therefore, the difference which you have observed, of one candle, between the illuminating power assigned to the gas by the one photometer and the other, to be due to the defects, now generally admitted, of the Evans box photometer. But we have no preference for the 'tower' photometer as compared with the more 'open' photometer used in the testing-place at Stoney Lane; and, with a view to the establishment of a greater uniformity in the official photometer which we hope before long to bring about, we are willing now to assent to your suggestion that the boxes which now surround the gas-burner and the candles should be removed, and that wooden screens should be substituted as at Stoney Lane.

(Signed) "A. Vernon Harcourt.
"William Pole.
"John Tyndall."

"F. Livesey, Esq., "*Dec.* 21, 1888.

"South Metropolitan Gas Company, Old Kent Road, S.E.

"Dear Sir,—In reply to your letter of the 18th inst., we wish to state that as we have re-examined the 'tower' photometer at the testing-place in Blackfriars Road with you, and neither we could discover nor you point out any defect in the instrument, we are not disposed to regard it as defective. We have assented to the removal of the boxes which now surround the gas-burners and the candles, and the substitution of wooden screens as at Stoney Lane, in accordance with your wish and on the grounds stated in our letter to you of July 16. A few days will probably be found sufficient for making the proposed alterations. We shall be glad, therefore, to hear from you shortly that the photometer is ready for our inspection in its altered form. The testings for illuminating power of gas supplied in Blackfriars Road district ought only to be suspended for as short a time as possible.

(Signed) "A. Vernon Harcourt.
"William Pole.
"John Tyndall."

It appears from the letter of the 16th of July that the Gas Referees could find nothing wrong in the photometer which was used in the Blackfriars Road testing-station; nor did the Chief Engineer of the Company point out anything that was wrong in it; again from the letter of the 21st of December that neither could the Gas Referees discover, nor the Chief Engineer point out, any defect in the instrument, and accordingly that the Gas Referees were not disposed to regard it as defective. The Gas Referees explain in the letter of July 16, that it was with a view to the establishment of a greater uniformity in the official photometer that they were willing to assent to a specific change in the photometer, thereby assimilating it to the photometer used at Stoney Lane. The Gas Referees point out defects in the construction of the photometer employed by the Company in a room adjoining the testing-station, and express the opinion that that photometer cannot fail on the average to give erroneous results. I consider that the returns from the Blackfriars Road testing-station for deficient illuminating power on the 5th and 10th of December must be accepted.

I am, Sir, your obedient servant,
A. W. Williamson.

This closed the case for the prosecution.

Mr. Besley said he had to address his Worship in the same way that he had had to address Mr. Vaughan on a previous occasion.* It was contended by the Metropolitan Board of Works that they had nothing to do but to take the Gas Examiner's certificate, get the maximum penalty, and levy distress upon the offending Company for the amount of the forfeiture. It had pleased the Legislature, by an Act of 1879, to say that people should not be dealt with in this way; and it was certainly given way to by Mr. Vaughan upon the occasion to which he had referred. There was a provision in the Act of 1879, which pointed distinctly that in future cases, when there was any forfeiture, the Magistrate had the fullest possible discretion to diminish the amount of the penalty. The 4th section said that in the case of fines the Magistrate might reduce the prescribed amount.

Mr. Roberts: This is a forfeiture.

Mr. Besley could not see the distinction. He was showing that if his Worship pleased, he could fine the Company a penny. Calling attention to the mode of testing gas, he remarked that the sperm candle would sometimes make a difference of from 15 to 20 per cent. in the result of the test. A difference might also arise by reason of the person testing not being accustomed to the work. In the present instance, the Examiner, though a gentleman of the highest scientific attainments, was not a good arithmetician. The Company were allowed to see the book of his tests at the Blackfriars Road Station. The tests in Blackfriars Road were made in one room by the official tester, and in the adjoining room by an official of the Company. On Dec. 5, the return made by the person appointed by the Company was above 16 candles.

Mr. Roberts: Is not this going behind the report?

Mr. Besley: How can you exclude it, when you are to make up your mind as to the penalty to be inflicted?

Mr. Roberts: It is on principle.

Mr. Besley: They are unprincipled, these kind of prosecutions.

Mr. Slade: You say, Mr. Besley, the report is wrong?

Mr. Besley: There is no such thing as a report of the Chief Gas Examiner. I am going to show you that this gentleman's report is absolutely inaccurate.

Mr. Slade: You can make the Chief Gas Examiner's report null and void.

Mr. Besley said that if it was null and void, they had the whole of the merits open.

Mr. Roberts remarked that in the special legislation with which they were dealing, there were special means shown for opening up any question where the gas examiner's return was contested. It could not be gone into in that Court; the Company had not availed themselves of the opportunity they possessed. The points they did raise were over-ruled.

Mr. Besley (continuing) said he must point out the grounds on which it would be very wrong for his Worship to put anything more than a penalty of a penny upon the Company in this instance. It was well known that, if the illuminating power of the gas was deficient, it led to dirty gas; and the same effect arose from making the gas of too high illuminating power. By the Act, for the first ½ candle deficiency, the Company were not to be laid under any penalty whatever. Testing was a delicate operation; and the result happened to be in this case, 15·4 candles—only one point or fraction less than 15½! It must be a whole ½ candle before there could be any penalty; and for this the forfeiture was 40s. The ½ candle must be exceeded before there could be any penalty.

Mr. Roberts: I say if the test is 15·5 candles, you have forfeited 40s.

Mr. Besley said if the language could not be construed as it was legitimately meant to be—that there should not be any forfeiture till the ½ candle had been exceeded—he did not know what the Act intended. He would undertake to say the Board had never taken out a summons for a defect less than ½ candle. There was another thing bearing upon the difference between the testing in one room of 16 candles and 15·4 candles in another room at the same station; and it was this: That on Dec. 27 a new apparatus was put in; and the testings since then had been the same.

Mr. Roberts: The Company put it in.

Mr. Besley admitted that they did; but it was of the same kind as was referred to by Dr. Williamson in his report. Now, the instruments corresponded one with the other. The Gas Referees allowed the new photometer; and since it had been put in it could not be contended that there had been any deficiency of illuminating power. A great deal of the deficiency might be owing to the gentleman who took the test. If he would smoke when testing, it might affect the amount of the return, as it was, as he had observed, a very delicate operation. In the Journal of Gas Lighting recently, Mr. Vernon Harcourt, one of the Gas Referees, was reported to have said that the whole cause of a dispute at Gloucester had been brought about by "the difference in the candles. He took samples from one testing-place to the other; and to some extent the difference was the variation, which Mr. Dibdin had alluded to, in the latitude which one gas examiner would allow himself in dealing with the candles as compared with another. The Local Authority Examiner, if he found the candles burning with such wicks as had been shown on the screen by Mr. Dibdin, rejected them until he found one that did burn properly. Of course, the result of the testing was largely dependent upon whether a selection was made of the candles, or whether they were used as they came. He took samples of the candles home from Gloucester, and found that the candles used at one of the testing-places contained more threads in each strand of the wick than in those used at the other. The more threads there were in each strand, the less light would there be given; and in these candles there was considerable difference in the amount of light obtained. Here a great deal of unpleasantness had arisen, without any blame to either of the gas testers (who had both carefully and conscientiously done their work), but which had been produced by the discrepancies which the candles brought about." He had another matter to refer to. In the book of the official tester at Blackfriars Road, they had found in the space of six weeks no less than 22 errors in arithmetic. The learned Counsel gave one instance in which, by error in calculation, a difference of 1 candle less than the result should have been was shown. And it was on the testing of this gentleman, he proceeded, that the Company had been brought into Court.

Mr. Roberts asked if this was bearing on the case. Why was not this matter put to Dr. Williamson?

Mr. Slade: He would not answer any question.

Mr. Besley said that Dr. Williamson never invited any inquiry, or appointed a place and time for inquiry. He received letters and read them; but the companies, he thought, would be well advised if they refused to correspond with Dr. Williamson after what he had said that day. Before calling witnesses, he should like to say that on Dec. 5 at Bedford Road, Clapham Road, the same gas from the same holders in the official returns was stated as of 16-candle power; while the tester at Blackfriars Road gave it as 15·4. In conclusion, he said that it was a most outrageous proceeding on the part of the Metropolitan Board to bring this matter into Court.

Mr. *Frank Livesey* was then called, and stated that he was Chief Engineer of the South Metropolitan Gas Company. In reference to what Mr. Vernon Harcourt had said in regard to sperm candles, he agreed that they varied considerably. This was the only time they had been summoned for a deficiency of illuminating power. He had been Engineer of the Company since 1880. They had had to appeal to the Gas Examiner perhaps four times in that period. He had appeared before Dr. Williamson; but not in later cases. With regard to the testing of Dec. 5, he did not go before Dr. Williamson, nor did anyone from the office. Everything he (Mr. Livesey) said was written in a letter. Dr. Williamson did not write after the receipt of his letter asking him to attend upon him; and he believed there were no other letters written before the final report. He then corroborated the statements of Counsel as to the errors found in the gas examiner's book. The 22 mistakes referred to occurred between Oct. 3 and Dec. 14. The testings at Bedford Road were made by a different examiner to the one at Blackfriars Road. The name of the Examiner at the first-mentioned place was Mr. Mills. His return was 16 candles; while that of Dr. Rideal was only 15·4.

Cross-examined, witness admitted that he did not make any application to Dr. Williamson to be heard. Questioned as to whether on previous occasions he had made application, he replied that when Dr. Williamson was in London, he generally asked him to attend on him. He had never made application to Dr. Williamson to be heard. He had suggested that he should like to have interviews with the Chief Examiner on former occasions, and had never been refused. Shown a document, he said that it was the statement he sent to Dr. Williamson in reference to the official returns of Dec. 5 and 10.

Mr. Roberts read the statement which was as follows:—

South Metropolitan Gas Company,
709, Old Kent Road, S.E., Dec. 13, 1888.

Professor A. W. Williamson, F.R.S.

Dear Sir,—I now beg to forward you my statement in reference to the two adverse reports for illuminating power at Blackfriars Road on the 5th and 10th of December, when a return was made of 15·4 candles in each case.

Shortly, my appeal to you will be that the photometer at this testing-station is not a correct instrument; and as the Gas Referees have given their permission to alter it, instructions have been given to carry out the work.

The Company have a photometer in an adjoining room to the official testing-room in which four or more tests are now made every day. The Company's tests made with candles on Dec. 5, were as follows:—10.30 a.m., 16·92 candles; 11 a.m., 16·70 candles; 3.15 p.m., 17·06 candles; and 4 p.m., 17·07 candles; while I understand that one of the official tests recorded was 13·9 candles. Again, on the 10th of December the Company's tests with candles in the adjoining room were 16·49, 16·68, 16·51, 16·68—average, 16·59 candles; the official test being 15·4 candles.

It is generally found that variations in quality at the works show themselves in greater or less degree at the testing-stations; but with this photometer at the present time, the tests in no way correspond. Some days with a high quality, a low return is sent in, and *vice versâ*; and as the same difficulty was experienced when the photometer was first put into operation, I cannot arrive at any other conclusion than that the instrument is not a correct one. This statement will, of course, also bear upon my appeal against the test recorded on the 9th of November at this station, though undoubtedly naphthalene was found there. None is there now; and this is a much more serious defect which would affect the tests at all times.

(Signed) F. Livesey, Chief Engineer.

Cross-examination resumed: He did not add anything to this report; nor did he apply to do so. The gas tested at Bedford Road and Blackfriars Road was supplied from the same gasholders at Kennington. There were no works at Kennington; it was only a storeage station. If the gas came from the same holder it would be identical.

Re-examined: The holders at Kennington were connected one with another. He did not think, with proper testing, it was possible for the gas from the same series of holders to show a difference of a candle in the results. The illuminating power of the gas at the works was considerably above the standard on Dec, 5.

Mr. *J. Somerville* deposed to being Engineer of the Bankside Gas-Works, from which the holders at Kennington were supplied. There were five holders at that station, all connected together. Before and after Dec. 5, the gas at the works had been of 16·6-candle power. The discrepancy in the testing at the two official stations on the day in question would arise at the testing-place itself. He had been connected with the Company about 10 or 11 years.

Cross-examined: The Company had two works in the neighbourhood of the storeage station at Kennington—Bankside and Vauxhall; and the gas produced at these two works went to those holders. It was impossible to say from which works this particular gas came.

*See Journal, Vol. LI., p. 475.

Re-examined: They were sometimes working "in and out"—that was to say, making and sending gas into a holder at the time they were supplying gas from it to the consumers. The tests at Bedford Road and Blackfriars ought to nearly correspond—within a point or two.

Mr. *J. Bond* deposed to having made the tests at Blackfriars Road on Dec. 5, and obtaining the results given in Mr. Livesey's statement. He had tested gas for the past eight years.

Dr. *Rideal* said he was appointed examiner at the Blackfriars Road station about October or November last year. He occasionally smoked while carrying on his operations in the testing-room. He did not select the candles he used; but took them as they came, so long as they were within the requirements of the Act. On being asked as to the inaccuracy of his figures in the particular instance quoted by Mr. Besley,

Mr. ROBERTS said he would admit the inaccuracy of the figures.

Examination continued: He had not made any tests since Dec. 27. The station had been closed. He could not say whether Mr. Sugg had been there since then; he really knew nothing about the station. As far as he personally was concerned, it was closed.

Cross-examined: He was a Doctor of Science of London, and a Fellow of the Chemical Society and Institute. He had tested gas for seven or eight years. He was also Lecturer on Chemistry at St. George's Hospital.

Re-examined: Most photometrists agreed that the candles were erroneous at times.

By Mr. ROBERTS: Before he received the appointment at Blackfriars Road, he was for several months in the service of the Metropolitan Board at Bow Road testing-station.

Mr. SLADE, in his judgment, said this was a summons for the supply of gas deficient in illuminating power. The whole question had been gone into as to the validity of the report of the Chief Examiner, which was put in to show that the gas was not of the proper quality. At first he was inclined to think that the report of the Chief Gas Examiner was improperly given, on the ground that he had not heard the parties, because the Act said that his decision, "after hearing the parties," was to be "final and conclusive." But Dr. Williamson said that he gave the parties an opportunity of appearing before him either in person or in writing; and he (Mr. Slade) saw that the letter of the Secretary of the Company to him, when the appeal was sent in, and which contained all the ground on which the appeal was based, said "the Engineer will send you full written particulars" in support of the appeal. They did not ask to appear in person, and expressed no wish to be heard. He could not see that Dr. Williamson had evaded the Act by not hearing the Company on this occasion, though he (Mr. Slade) did not think he ought in future not to give them the opportunity, by inviting them to appear. Then came the question of penalty for non-supply of gas of proper illuminating power. They had heard a great deal of evidence. Although the evidence of the Company was very strong as to what the illuminating power was on Dec. 5 at the various stations, it was difficult to go against the evidence of so distinguished a gentleman as Dr. Rideal. He could not help thinking from the evidence that the Company did not supply gas of proper illuminating power, though it was only a question of decimals. The justice of the case would be met by a fine of 10s. and 2s. costs; and this would also apply to the second case.

WOOLWICH POLICE COURT.—FRIDAY, FEB. 15.

(*Before Mr.* MARSHAM.)

THE METROPOLITAN BOARD OF WORKS *v.* THE SOUTH METROPOLITAN GAS COMPANY.

The South Metropolitan Gas Company were to-day summoned by the Metropolitan Board for supplying gas of less illuminating power than prescribed by Act of Parliament; the default having been on Nov. 12 and 16 at the testing-station, 211, Burrage Road, Plumstead.

Mr. ROBERTS appeared for the Metropolitan Board; Mr. BESLEY for the Company.

Mr. BESLEY said that the Company had been summoned on two cases of supplying gas of rather more than half candle less illuminating power than was prescribed by the Act. The latter fixed the standard at 16 candles. The tests were made a day or two after the testing-place was opened; and there was reason to believe that the supply-pipe was choked with foul air. As soon as the chokage was cleared, the tests in the Company's testing-room and of the Metropolitan Board approximated pretty closely. The Company did not admit there was any deficiency; but as the Chief Gas Examiner after appeal maintained the accuracy of the Gas Examiner's figures, the defendants had consented, after the hearing of a similar summons before Mr. Slade at Southwark Police Court, to consent to a similar fine—viz., 10s. and 2s. costs in each summons.

Mr. ROBERTS said, having regard to the decision of Mr. Slade, given after a prolonged hearing, the Metropolitan Board were willing to accede to the proposition made by Mr. Besley. The Board had the Chief Gas Examiner present in Court ready to substantiate the two summonses in the event of the Company disputing either of them. The deficiency at Southwark was half a candle, the penalty being 40s.; but the Magistrate had discretionary power to mitigate it if he thought fit. The Board took the proceeding more from principle than for the sake of a few shillings penalty. Under all the circumstances, he would accede to the proposal of the Company.

Mr. MARSHAM said he was glad Mr. Slade had the hearing of the other summonses instead of him. He was willing, under the circumstances, to inflict the mitigated penalty of 10s. and 2s. costs in each case, in the hope that the full illuminating power would be kept up by the Gas Company in future.

BROMLEY GAS CONSUMERS' COMPANY.—Reporting upon the operations of this Company during the past half year, the Directors state that the general working has been satisfactory; and the make of gas has increased nearly 4 per cent. The profit and loss account shows a balance available for dividend of £5693; and the Directors recommend the payment of dividends on the old capital at the rate of 11 per cent., and on the new of 8 per cent., which will require £4636—leaving a balance of £1057, which the Directors recommend (for reasons hereafter mentioned) should be carried forward to the current half year. The Directors having succeeded in making a new contract for coal on somewhat better terms as to price and delivery, and in view of the fact that the price of residuals has considerably improved, and also that after July in all probability the coal dues will cease to be payable, have reduced the price of gas from 3s. 6d. to 3s. per 1000 cubic feet as from the 1st. ult. As this reduction will probably affect the gas-rental of the current half year to an extent approaching £1000, it has been thought desirable to carry forward the whole of the balance of £1657; and with its aid the Directors confidently hope to keep up the dividend to its usual amount without having recourse to the reserve fund. To provide for the balance due to the contractors for the new tank and holder, a further sum of £4000 has been borrowed on mortgage debenture, at the rate of 4 per cent.

Miscellaneous News.

PROVINCIAL GAS AND WATER COMPANIES.

The following paragraphs contain the chief features in the reports just issued by the several Companies mentioned:—

The rental of the Bath Gas Company increased to only a moderate extent during the six months ending Dec. 31 last, as compared with the corresponding six months of the previous year. This the Directors account for by the unusually mild weather which prevailed during the last quarter of the year, and which checked consumption. There was, however, a favourable improvement in the residuals account; and the Directors recommend the declaration of maximum dividends at the half-yearly meeting on the 28th inst.

The report presented at the half-yearly meeting of the Bury St. Edmunds Gas Company on the 8th inst., showed that the profit for the latter half of 1888 would allow of dividends of 12s., 9s. 6d., and 9s. per share, and leave £2614 to be carried forward; and these were declared.

The Directors of the Ipswich Gas Company, in the report submitted to the shareholders at their annual meeting yesterday, stated that the profit and loss account showed a balance of £10,551 17s. 1d., including a sum of £2592 18s. 3d. brought forward from the previous year. Of this amount £3577 15s. has been applied in payment of an interim dividend of 10s. per share upon the "A" shares, 7s. 6d. per share upon the "B," and 7s. per share upon the "C" shares. They recommended that further dividends of 12s., 9s. 6d., and 9s. per share upon these classes of shares be paid on the 1st prox.; making, with the interim dividend paid in September last, a dividend for the year of 11, 8½, and 8 per cent. respectively. A balance would remain of £2529 17s. 1d. From this they recommended that £850 should be carried to the insurance fund, to be invested, and that the balance of £1679 17s. 1d. should be carried forward. A most gratifying increase of upwards of 6 per cent. in the sale of gas took place during the year. The Directors consequently felt justified in announcing a further reduction in price from the 1st of July next, after which date the charge for gas will be 2s. 10d. per 1000 cubic feet.

The revenue of the Newcastle and Gateshead Water-Works Company in the twelve months ending the 1st inst., as shown by the report which the Directors will present to the shareholders at their meeting next Tuesday, was £87,133; being an increase of £2513 on the preceding year. After payment of all claims, there is a balance (with the amount brought forward) of £39,495 available for division. The Directors recommend the payment of the usual dividend on the preference stock, one at the rate of £9 10s. per cent. per annum for the half year on the old stock (making with the interim dividend £8 10s. per cent. for the year), and one at the rate of £6 13s. per cent. per annum on the ordinary stock of 1876 (making £5 19s. per cent. for the year). These will absorb £34,378, and leave £5117 to be carried forward. The number of consumers on the Company's books increased by 2186 last year. The whole of the capital having now been called up, the Directors have been considering the desirability of obtaining further money powers; and as additional works will be required during the next few years, they have had the advice and assistance of Mr. T. Hawksley on this subject. These matters have been embodied in a Bill which will be submitted to the shareholders next Tuesday for their approval.

The Directors of the Sunderland and South Shields Water Company report an increase of £1847 in the revenue from water-rents last year, as compared with 1887. They recommend that a dividend at the rate of 4½ per cent. on the ordinary and preference stocks of the Company for the six months ending Dec. 31, 1888, be declared—making, with the interim dividend paid in September last, 9 per cent. for the year; and also that interest at the rate of 5 per cent. per annum be paid on the amount called up on the shares allotted on Sept. 3, 1875.

At the 36th ordinary general meeting of the Weardale Water Company, which was held on Monday last week, the Directors presented a report which showed that the profits on the working of the past year allowed of a dividend of 3¾ per cent.; being an advance of ¼ per cent. on that for the previous year.

Although the Directors were able to recommend the usual dividend at the rate of 8 per cent. per annum for the past half year at the ordinary meeting of the shareholders of the Normanton Gas Company last Saturday week, the accounts were not quite so satisfactory as they were for the previous six months. During the half year the consumption had fallen off three-quarters of a million cubic feet, chiefly through the stoppage of large leakages at the railway station. The result was that only a sum of £50 was available to be added to the reserve fund, as against £100 in the preceding half year.

The half-yearly meeting of the Scarborough Gas Company was held on Saturday, the 9th inst., when the report of the Directors, which was submitted by the Chairman (Alderman Fowler), disclosed a healthy state of affairs. The revenue accounts showed a profit for the half year of £6685. The net revenue, including £834 brought forward from the last account, and after deducting all interest charges, was £6865. Out of this sum, after providing for the 5 per cent. dividend on the preference stock, the payment of the maximum dividends upon all other stocks was recommended. This would absorb £5036; leaving £1829, from which the Directors proposed that £615 be repaid to the reserve fund, being the amount of the last withdrawal therefrom, and that the balance be carried forward to the next accounts. For the purpose of meeting additional outlay on capital account, and providing for the steady growth of the Company's business, it will be necessary during the current half year to make a further call of 50 per cent. upon the new stock allotted in 1885. The mortgages which had matured during the half year had been renewed at the rate of 3½ per cent. per annum. The report was adopted.

The enhanced value of residuals and sulphate of ammonia, together with a small increase in the consumption of gas, has enabled the Directors of the Bromsgrove Gas Company to pay an increased dividend—at the rate of 7 per cent. per annum. At the meeting of the Company yesterday week, the Chairman (Mr. Jefferies) congratulated the shareholders on the result of the year's working.

The profits of the Southport Water Company have substantially improved since 1881. In the second half of that year, they stood at £5549, and last half year the figure was £8871. The total expenditure on capital to Dec. 31 was £316,356, against £282,266 at the end of 1881. At the meeting of the shareholders last Saturday week, a dividend at the rate of 6½ per cent. per annum was declared on the paid-up share capital.

The gross receipts of the Sevenoaks Gas Company for the past half year amounts to £5162 15s.; and the expenditure to £2952; the balance of profit and loss account is £2529; and the Directors in their report propose the payment of the statutory dividends of 10 per cent. per annum on the original capital, and 7 per cent. per annum on the additional capital (both less income-tax).

In their report on the operations of the past year, the Directors of the Harrogate Gas Company state that after paying the interim dividend,

debenture interest, and all necessary charges, a balance of £4545 remains, from which they recommend a dividend on the "A" stock of 7½ per cent.; on the "B" stock, of £5 12s. 6d. per cent.; on the "C" stock, of 5½ per cent. The total dividend is equivalent to 8½ per cent. upon the paid-up capital of the Company. After paying the dividend, and a contribution of £615 to the reserve fund, a sum of £880 will remain to be carried forward. The reduction of 3d. per 1000 cubic feet made on Jan. 1, 1888, represents an additional saving to the consumers of nearly £1000 per annum; and if there had been no improvement in the business of the Company, the profits would have been reduced by that amount. But the increased consumption of 8¾ per cent. during the year, coupled with augmented revenue from fittings and other sources, has induced the Board to announce a further reduction of 3d. per 1000 cubic feet from April 1, 1889. The Directors have had to resort to the 1887 balance in order to pay the authorized dividend for 1888; thus reducing the balance by about £189. The net price of gas (after the above-named reduction) will be: To private consumers, 3s. 2d. to 2s. 9½d. per 1000 cubic feet, according to quantity consumed; for cooking purposes, 2s. 9½d.; and for public lamps, 2s. 8d. There has been a satisfactory accession of new consumers; and 94 additional gas-stoves have been let on hire.

The report of the Directors of the South Staffordshire Water Company states that the number of houses laid on during the half year ended Dec. 31 last was 1121; making the total supplied 66,762. The gross amount of water-rates for the half year was £34,605, as against £34,717 in the corresponding period of the previous year. After providing for interest on debenture stock and preference stock, the amount remaining for division (including £696 17s., the balance brought from last half year) is £13,349; and the Directors recommend the declaration of a dividend for the half year on the ordinary stock at the rate of 5 per cent. per annum, less income-tax. The amount of this dividend being £12,535, there will remain £814 to the credit of next half year.

The Woking Water and Gas Company, in their report for the half year ending Dec. 31 last, recommend a dividend at the rate of 3½ per cent. per annum, leaving £31 to be carried forward. The revenue for the year 1888 was £3360; and the expenditure, £1403. The balance available for division is £962.

In the report of the Directors of the Canterbury Gas and Water Company, for the six months ending Dec. 31 last, which will be presented to the proprietors on the 25th inst., the balance standing to the credit of the profit and loss account is stated to be £6291; and the usual dividend at the rate of 8 per cent. per annum is recommended.

At the half-yearly meeting of the Weymouth Gas Company last Thursday, the accounts presented for the half year ending Dec. 31 last bore a favourable comparison with those for previous periods. The reduction of 1d. per 1000 cubic feet in the price of gas and a slight decrease in the consumption, attributable to the mildness of the winter season and the comparative absence of dark weather, caused a diminution of £514 14s. 5d. in the gas-rental. The returns from residual products, however, were more than equal to those of the preceding year. On the revenue account the balance of profit is £2056 14s. 10d., which more than sufficed for the payment of the interest on the debenture bonds and the maximum dividends on the other capital. The Directors recommended dividends for the half year at the rates of 10 and 7 per cent. per annum, subject to deduction for income-tax. This was agreed to.

Yesterday week, the shareholders of the Preston Gas Company held their half-yearly meeting. The report of the Directors, which was adopted, stated that an increase amounting to £2209 had resulted from the sale of gas to private consumers; and residual products showed an increase of £1605. The Directors recommended that the usual dividends of 10 and 7 per cent. per annum be declared; and this was agreed to.

BIRMINGHAM CORPORATION GAS DEPARTMENT.

Committee's Annual Report.

The Gas Committee of the Birmingham Corporation have issued their report on the working of the Department during the past year. They state at the outset that, in order to meet the increased output at the Windsor Street works which was not provided for when the annual contracts for coal were made, an additional 4500 tons have been bought for delivery in January and February. Memorials, it is stated, have been received from the workmen employed in purifying and as coke loaders, asking that the holidays granted to their fellow-workmen should be extended to them. These workmen, although subject to the control of the Engineers, are not in the direct employment of the Corporation; being employed under piece-workers. They do not, therefore, technically come within the scope of the resolution of the Committee granting these holidays, which has already been reported to the Council. The Committee, however, on reconsideration of the question, have decided to extend the holidays to these men. The total annual cost of the holidays is now estimated at £690, as against £75—the cost of holidays granted to workmen in former years. An application having been made by 46 consumers in the district of Moxley, within the Corporation area of supply, hitherto served by the Bilston Gas Company, for a supply of gas to their premises from the Corporation mains, the Committee informed the Bilston Gas Company that it was their intention to comply with the request. The Directors of the Company replied that, after due consideration of the documents in their possession relating to their purchase of mains from the Staffordshire Gas Company, they would not contest the right of the Corporation to give the supply; and they proposed that the Corporation should purchase from them the main and meters through which the supply had hitherto been given. The Committee accepted this offer; and, on the valuation of the Engineers of both undertakings, have paid the Bilston Gas Company £100 for the plant so transferred. Applications being from time to time received from consumers who desire to provide lamps in the streets opposite their premises, and are willing to keep such lamps lighted during the hours in which street-lamps are in use, and to pay for the gas used in such lamps at the ordinary prices, the Committee have been in correspondence with the Public Works Committee on the subject; but they have been informed by that Committee that they are not prepared to make exceptions to their rule forbidding the erection of such lamps. At the request of the Handsworth Local Board, the public lighting in the Handsworth district has been transferred to the Board as from Nov. 16; and the Committee have agreed that the gas supplied to the public lamps in that district shall be charged at the reduced rate as from Oct. 1. The Local Board having undertaken to light, clean, and extinguish lamps in courts within their area free of charge, and to maintain the lamps on the usual terms, the owners of such lamps have been informed that gas will in future be supplied to these lamps on the terms on which it is supplied for street lighting in the district. The Committee call attention to an application received from Mr. Henry Hack, the Engineer of the Saltley and Swan Village works, for an increase of salary to £1200 per annum. Mr. Hack bases his application on the ground that he is entitled, on statements made to him when his salary was revised on his giving up the house formerly occupied by him at Saltley, to be placed on an equality with the other Engineer; and also on the large savings which have been effected in the cost of manufacture at the works under his charge since the transfer. The Committee have informed him that, in raising the salary of his colleague (for which the Committee thought there were special reasons), they did not intend to imply that the one had any higher authority than the other; and they now recommend that Mr. Hack's salary be increased from £900 per annum, with an allowance of £50 per annum for house, to £1050 per annum, from July 1, 1888, inclusive of allowance for house. They also recommend that the salary of the Accountant (Mr. J. Holmes) be increased from £200 to £250 per annum, from the 1st of January last. The sale of gas for the year has been 3,482,923,800 cubic feet, as against 3,378,554,900 cubic feet in 1887; being an increase of 104,368,900 feet, or about 3 per cent. The number of new services laid during the year was 1957, as against 1856 for the year 1887; being an increase of 101. There were 208 official tests of the illuminating power of the gas made during the year—the highest being 17·97 candles; the lowest, 16·82 candles; and the average, 17·34 candles, or 2·3 candles in excess of the parliamentary standard. The quantity of coke in stock at the various works on Dec. 31 was 6891 tons, as against 3572 tons at the corresponding period of 1887; being an increase of 3319 tons. The number of cooking and heating stoves and gas fires supplied by the department during the year was 747. The cost of repair of meters for the half year ended Dec. 31 was £3147; and the number repaired, 4802. The Committee have informed the Finance Committee that they hope to place the sum of £25,000 to the credit of the improvement rate for the year 1889. The accounts show that the net profit for the year amounts to £40,915, after appropriating £4219 to the sinking fund for the redemption of loans and annuities, and £14,400 to the new offices account, being the balance of the amount which it was arranged should be appropriated to that account out of revenue. The Committee recommend that the balance of £15,915 be added to the reserve fund—making that fund £82,960.

The following are the items (shillings and pence omitted) of the revenue account, preceded by the similar items of the previous year:—

Expenditure.

1887.			
£158,946	Manufacture of gas—		
	Coals	£161,750	
3,268	Purifying materials and wages	3,025	
4,425	Salaries at works	4,391	
33,330	Wages at works	35,157	
69,067	Repairs and maintenance of works	69,812	
			£274,138
	Distribution of gas—		
11,738	Salaries in light office	£11,941	
15,135	Repairs, maintenance, and renewal of mains and service-pipes	11,210	
7,495	Repairing and renewing meters	6,807	
			29,959
2,640	Lighting and repairing public lamps		2,550
650	Rents		621
16,881	Rates and taxes		17,353
	Management—		
2,573	Salaries	£2,882	
888	Collectors	864	
866	Stationery and printing	771	
5,292	General charges	3,720	
84	Auditors	84	
			8,273
73	Law and parliamentary charges		95
1,575	Bad debts		1,535
100	Bank charges		100
83	Recreation grounds at Nechells		66
16	Expenses on loans and annuities		157
318	Contributions to workmen's sick fund		149
340	Illuminations		—
£333,587	Total expenditure		£335,001
126,258	Balance carried to profit and loss account		152,195
£459,845			£487,196

Receipts.

£377,778	Sale of gas	£387,841
79,399	Residual products	95,427
2,368	Rents	2,332
Dr. 249	Fittings	1,121
540	Discounts on purchases	475
9	Transfer fees	7
£459,845		£487,196

Included in the total revenue received from the sale of gas are the following items:—

Common gas	128,500 cubic feet	at 3s. 1d.	per 1000		£19
"	89,400	" 2 11	"		5
"	1,214,014,200	" 2 7	"		156,810
"	491,160,600	" 2 5	"		59,348
"	1,587,063,600	" 2 3	"		178,544
Public lighting and under contracts					11,232

The profit balance of £152,575 is disposed of in the following way:—

Annuities		£54,874
Interest on Birmingham Corporation Stock to Dec. 31, 1888		19,824
Interest on mortgages and bonds		8,044
Sinking fund—		
Interest on amount applied in redemption of loans	£10,296	
Instalment for redemption of loans and annuities	4,219	
		14,515
Amount carried to new offices account		14,400
Balance, being net profit for the year		40,915
Total		£152,575

The Electric Lighting of Ipswich.—At the meeting of the Ipswich Town Council last Wednesday, on the recommendation of the Paving and Lighting Committee, the Council passed a resolution generally approving of the granting of the Licence which the Ipswich Electric Light and Power Association are about to apply for, to authorize them to construct and maintain electric lines and works, and to supply electricity within the borough.

Accident to a Gasholder at the Walsall Gas-Works.—It is reported that a serious accident occurred last Tuesday to the holder at the Pleck Gas-Works of the Walsall Corporation. It appears that for some time there has been a slight tilt in this holder; and the frost, snow, and especially the heavy gales of the previous few days so far increased this that the holder was completely jammed and immovable, besides being somewhat damaged. This resulted, it is said, in portions of the town being thrown into semi-darkness. Arrangements were at once made by which a little help was obtained from Birmingham, through the Wednesbury gas-main. The chief dependence will, however, have to be placed on the old works of the Corporation in Wolverhampton Street, which are quite inadequate to the needs of the town. Under these circumstances, the Mayor has issued an appeal to consumers to employ other light as far as possible for the present, and to use no gas for heating or cooking.

THE ELECTRIC LIGHTING EXPERIMENT AT BARNET.

A Record of Failures of the Lighting.

Our readers have doubtless followed with much interest the accounts we have given from time to time of the experiment in electric lighting which has been going on for nearly six months at High Barnet. The installation commenced on the 1st of September last year with 71 incandescent lamps; and, although the Local Authority was lauded by the majority of the press for their public-spirited enterprise in adopting the new light, its advent in Barnet was not unattended with a certain amount of discomfort, not to say pain, to the projectors of the scheme. From the first it has been a weakly bantling; and its struggles for life would be amusing, were it not for the annoyances, and even dangers, it has needlessly entailed on the unfortunate inhabitants. The brief reports which have from time to time appeared in our columns of what has taken place at the meetings of the Local Board have been sufficient to show how unreliable the lighting has been all through; and in our last issue we had to record the fifth total failure. But in order that our readers may be in a position to judge for themselves in the matter, we give below a list of the days on which particular lamps, and sometimes the whole installation, have been out.

Date.	Lamps Out.	Date.	Lamps Out.	Date.	Lamps Out.	Date.	Lamps Out.
1888, Sept. 1.	—24	Oct. 1.	—2	Oct. 29.	—2	Nov. 28.	—2
2.	—26	2.	—2	30.	—1	29.	—2
3.	—25	3.	—7 (*d*)	31.	—2	Dec. 1.	—1 (*l*)
4.	—23	4.	—8	Nov. 1.	—5	2.	—1
5.	—25	5.	—6	2.	—4 (*g*)	8.	—1(*m*)
6.	—25 (*a*)	6.	—2	3.	—2	9.	—1 (*n*)
7.	—24	7.	—3	4.	—2 (*h*)	10.	—1
8.	—23	8.	—4	5.	—1	15.	—1
9.	—24	9.	—3	6.	—1	16.	—1
10.	—21	10.	—2	7.	—1	23.	—1
11.	—18	11.	—4	8.	—1	29.	—1
12.	—20 (*b*)	12.	—7	9.	—1	31.	—1
13.	—19	13.	—4	11.	—(*i*)	1889, Jan 5.	—1
14.	— 8	14.	—4	12.	—1	6.	—1
15.	— 8	15.	—5	13.	—3 (*j*)	7.	—1
16.	— 7	16.	—4	14.	—3	11.	—(*o*)
17.	— 9	17.	—6	15.	—3	13.	—1
18.	— 2	18.	—2	16.	—3	14.	—1
19.	— 3	19.	—3	17.	—2	23.	—5 (*p*)
22.	— 3	20.	—4	19.	—1	24.	—3
23.	— 2	21.	—4	20.	—1	26.	—2
24.	— 3	22.	—2	21.	—3	27.	—2
25.	— 4	23.	—1 (*e*)	22.	—4	28.	—(*q*)
26.	— 3	24.	—2	23.	—1	Feb. 6.	—(*r*)
27.	— 5	25.	—1	24.	—1	7.	—1
28.	— 3 (*c*)	26.	—1	25.	—1	9.	—1
29.	— 3	27.	—1	26.	—1 (*k*)	10.	—1
30.	— 3	28.	—1 (*f*)	27.	—1	11.	—1 (*s*)

Remarks.

(*a*) Sept. 6.—All lamps went out at 10.15 p.m. for some minutes. (*b*) Sept. 12.—The lamps were lit this night at 7.15 p.m.; at 7.45 all went out. They were relit; but again went out at 8.25 p.m., and were not relit. (*c*) Sept. 28.—All lamps went out at 9.55 p.m., and remained so. (*d*) Oct. 3.—Lamps not lit till 6.45 p.m. (*e*) Oct. 23.—All lamps went out from 9.25 to 9.50 p.m. (*f*) Oct. 28.—All lamps nearly out at 6.25 p.m. (*g*) Nov. 2.—All lamps out from 5.40 to 5.50 p.m. (*h*) Nov. 4.—All lamps out from 5.25 to 5.40 p.m. (*i*) Nov. 11.—All lamps out from 7.25 to 7.43 p.m. (*j*) Nov. 13.—All lamps out from 6.45 to 7.15 p.m. (*k*) Nov. 26.—All lamps out from 6.37 to 6.45 p.m. (*l*) Dec. 1.—All lamps out from 11.22 to 11.35 p.m. (*m*) Dec. 8.—All lamps out from 6.35 to 9.20 p.m. (*n*) Dec. 9.—All lamps out at 11.45 p.m., and remained so. (*o*) Jan. 11, 1889.—Nearly all lamps out from 9.5 to 10.10 p.m. (*p*) Jan. 23.—All lamps out till 9.5 p.m. (*q*) Jan. 28.—All lamps out from 5.50 to 5.55 p.m. (*r*) Feb. 6.—All lamps out from 7.10 to 10.15 p.m. (*s*) Feb. 11.—All lamps out from 10 to 10.7 p.m.

Not only do the lights totally disappear for minutes and hours together, from a multiplicity of mysterious mishaps—including alleged cutting of wires and breakage of poles carrying the wires, failure of machinery, &c.—but they vary continually; the light at times being brilliant, and raising the drooping spirits of its partisans, at others so dull as only to render darkness visible by glowing bits of wire. No wonder, then, that the Local Board are exercised as to whether they are receiving what they pay for—viz., 32-candle power lamps—and have appointed an expert to advise them (at, of course, more expense). Add to these incidents the danger of overhead wires and the extra cost, and the inhabitants may well wish for an early deliverance from the so-called "light of the future."

The following extract from the *Electrical Review* of Saturday last will be an interesting *addendum* to the above:—"For 'childlike and bland' methods of procedure, nothing has more commended itself to us than the tactics adopted in testing the candle power of the incandescent lamps at Barnet. The local authorities were desirous of ascertaining whether they were getting the amount of light guaranteed by the contractor—viz., 32-candle power per lamp; and for this purpose, Mr. W. H. Preece was engaged. The meeting of the Barnet Local Board, as described in the *Barnet Press* of Saturday last, resulted in a highly edifying description of the *modus operandi*. It appears that the expert in photometry found it necessary to inform the contractor when his measurements were to be taken; and, as Mr. James truly remarked, of what value is a report under such conditions? By over-running, the lamps may be sent up to any candle power short of breaking the filaments, and naturally the contractor would strain every nerve, and his dynamo too, to have the lamps well up to specification at a given hour. Why did not the expert go down, as we have done on several recent occasions, entirely unknown to anybody, and make his tests there and then? We say again, as we have done previously, that the lighting of Barnet by electric lamps was, in our judgment, no better than the illumination produced by ordinary street gas-jets; and the absurdity of paying any heed to reports sent in under such conditions as we find stated in the *Barnet Press*, needs no further comment. If, however, the results are ever made public,* we will venture to assert that the lights will be found to vary 100 per per cent. amongst themselves. It is, however, satisfactory to observe that Mr. James and several of his colleagues on the Board are not blind to the little farce which is being played. The whole history of this unfortunate installation can only be likened to the 'Comedy of Errors.'"

Stockton and Middlesbrough Water Supply.—The accounts of the Stockton and Middlesbrough Water Board for the past half year show that the receipts, including precepts on capital account of £36,000, amounted to £70,704; whilst the expenditure was £59,575, of which £30,184 was debited to capital account. The receipts for water supplied showed an increase of £4094 on the average for the past three years.

* We learn from the *Barnet Press* of Saturday last that the report of the expert was discussed by the Local Board in Committee on the 12th inst.—Ed. J. G. L.

THE OIL LIGHTING AT ERITH.

At the Meeting of the Erith Local Board on Monday evening last week, the subject of the oil lighting of the district was again under consideration. It arose on a report of the Finance Committee recommending certain payments; among others, a sum of £100 to Messrs. Defries, the lighting contractors. The Committee admitted that more than this was due; but they put down the amount mentioned because there was a question of the fines for the lamps which had been found not alight. The Chairman (Mr. C. A. Streeten) explained that altogether £166 was owing to Messrs. Defries. Up to the present time, the amount the Board had had to deduct for fines, at the rate of 2s. 6d. for each lamp found not to be alight, was £22 5s.; and of course the Board would enforce the fines. He suggested, however, that the Clerk be instructed to write to Messrs. Defries, stating that it was not fines the Board wanted, but that the lamps should not go out; and they wished attention to be paid to remedying this in some way. Mr. Plummer remarked that there were 17 lamps out in one night. The Chairman said that since the last meeting of the Board (three weeks previously), 93 lamps had been found not alight; and no less than 26 were out on one very windy night. The Board would rather see the lamps alight than have to keep on deducting fines. Mr. Heaps said he thought that more attention should be directed to the large lamp opposite All Saints' Church, Belvedere, which he saw out one night at eight, and then again at a quarter to twelve.* He considered that the matter might be remedied by the lamplighters going over the ground again every night. Mr. Plummer said he had seen the lamplighters two or three times on one night. It was not the Board's business, but was it to be expected that the men would keep running round all night for the money they were paid? The Chairman having again remarked that it was an unpleasant thing for the Board to be constantly enforcing fines on the contractors, it was agreed to instruct the Clerk as suggested. Referring to this matter last Saturday, the *Erith Times* remarked that the fines imposed on the lighting contractors were not an "adequate balm to the feelings of the ratepayers, many of whom must have been inconvenienced by the defect, or the neglect, as some are disposed to think it. The ratepayers do not want a cheap defective light; and unless the contractors do something, oil lighting will run a great chance of being put down in this category. Messrs. Defries entered into a contract to provide illumination for the district by a means in which, through their representations, the ratepayers placed much faith; and now that there is a question of its unreliability in windy or rough weather, the contractors ought not to quietly sit down and see themselves fined without endeavouring to obviate the defect."

THE PUBLIC LIGHTING OF LEAMINGTON.

A Return to Gas.

At the Meeting of the Leamington Town Council yesterday week—the Mayor (Alderman Flavel) presiding—an animated discussion on the lighting of the streets took place.

A letter was read which had been received from the Board of Trade, stating that the attention of the Department has been called to the fact that certain streets in the district had been, or were being broken up, with a view to the laying of mains for the supply of electricity by persons having no statutory powers under the Electric Lighting Acts, 1882 and 1888; and pointing out that no member of the public, and no company, had, either with or without the consent of the local authority, a legal right to interfere with the public highway in such a manner as to cause an obstruction, without first obtaining statutory powers. The Board pointed to the desirableness of considering what steps may have to be taken in view of these facts; and asked for the observations of the Council upon the matter.

The Town Clerk (Mr. Passman) intimated that the letter had a serious bearing on the position of Messrs. Chamberlain and Hookham, the representatives of the Company supplying the Parade as well as private consumers with the electric light, as it threw a doubt upon their capacity to enforce payment of their demands for the electric current supplied.

The letter was referred to the General Purposes Committee.

The following communication was read from Mr. Arthur Chamberlain, and its consideration was deferred:—"We have much pleasure in acknowledging the receipt of your formal notice to discontinue the supply of electricity to the public lamps on the 17th of January, 1890, and in accepting the same. It has struck us that if your Council are really as dissatisfied with the existing contract as the published report of their proceedings would lead people to suppose, they would be glad to arrange for an earlier termination of the contract than that provided for by the agreement. In this event we shall be very happy to arrange for such an earlier termination—say, on the 25th of March or the 30th of June. We believe we give the Council entire satisfaction in regard to the indoor electric lighting of their Municipal Buildings, Assembly-Room, and Pump-Room, and should like, at the earliest possible date, to confine our operations to those applications in which the superiority of the electric light is admitted."

Mr. Crowther Davies then proposed the following resolution, of which he had given notice:—"That the Parade and other streets and places in the borough as may be determined by the Town Council be lighted by means of Bray or Sugg gas-lamps." He stated that every member of the Corporation was dissatisfied with the present system of lighting the Parade by electricity, and was anxious to put an end to the existing contract as soon as possible. If the Council adopted Bray's or Sugg's gas-lamps, an admirable light would be obtained, and the ratepayers would get value for their money, which they were not now obtaining from the Electric Light Company. The Parade and Bath Street could be lighted with fifty Bray's or Sugg's lamps, each of 60-candle power, for £187 a year; being considerably less than half the cost of the present system. With his usual good taste and courtesy, Mr. Arthur Chamberlain, had informed the Council that it had given him a great deal of pleasure to receive their notice determining the agreement. He (Mr. Davies) could only suppose that the Midland Electric Light Company were unable to give Leamington an efficient street illuminant such as the ratepayers were willing to pay for. He did not agree with those who said that the Electric Light Company should be taught a lesson by being compelled to continue the supply till January next. Although he had no vindictive feeling towards the Company, he would not be a party to any jerrymandering in the shape of future experiments. He did not impugn the *bona fides* of the promoters; but he doubted their power to produce an efficient light at a reasonable cost.

Alderman Gilbert in seconding the motion, said that he thought members of the Council had enjoyed ample opportunities of comparing Bray's and Sugg's lamps with the electric light.

Mr. Hodkisson proposed, as an amendment, that the Watch Committee

* In reference to the lamp here alluded to, we may explain that it is situated at the junction of four cross roads; and this being regarded as a dangerous point, the West Kent Gas Company, when the lighting was in their hands, put up a special high-power burner there, and kept it alight for an hour after midnight.—Ed. J.G.L.

be requested to ascertain the best means of lighting the Parade, Regent Street, Warwick Street, and High Street with gas; and the initial and annual cost.

Mr. SALMON seconded the amendment.

Mr. HARVEY, in support of the original proposition, remarked that it was admitted on all hands that the lighting of the Parade by electricity was a failure, and that there was a general desire to return to the regularity with which the Parade was previously lighted by gas.

MR. FELL moved a second amendment, remitting the whole question of street lighting to the Watch Committee for consideration. He confessed that he was startled at Mr. Crowther Davies's statement that a Sugg lamp, such as that already burning in the district, only cost £3 14s. 9d. a year, as against £2 2s. paid for an ordinary gas-lamp. If the Leamington Corporation had been treated in a different way from that in which the Electric Light Company had dealt with them, events might have taken a different course, as the Company had never recognized that any responsibility rested upon them.

Mr. JOHNSON did not think the Gas Company would supply a vastly superior light to that with which they previously lighted the Parade at less money than that formerly paid for the purpose.

The BOROUGH SURVEYOR expressed an opinion that fifty Sugg's or Bray's lamps of 60-candle power would be sufficient in the Parade.

Mr. HODKISSON withdrew his amendment in favour of Mr. Fell's.

The amendment was rejected, and the proposition carried by eleven votes to six.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Directors of this Company, in their report for the six months ending Dec. 31 last, which will be presented to the shareholders at their meeting next Saturday, present a fairly satisfactory statement as to the working of the undertaking in this period. The reduction in the price of gas from 3s. 4d. to 3s. 2d. per 1000 cubic feet, which came into operation on the 1st of July last, has resulted, upon comparison with the corresponding half of 1887, in a decrease of 2¼ per cent. in the gas-rental; but as the sale of gas shows an increase of 3,631,000 cubic feet, equal to 2¾ per cent., the Directors have reason to believe that the outcome of the current half year will compensate for the reduction. After passing the sum of £600 to the credit of the insurance fund (being ½ per cent. on the paid-up capital) the profit and loss account, inclusive of £3689 11s. 9d., undivided at the 30th of June last, shows an available sum of £9328 14s. 8d., out of which the Directors recommend the payment of dividends at the rate of 11½ per cent. per annum upon the original capital, and on the new ordinary capital at the rate of 8½ per cent. per annum, both less income-tax, amounting to £5850 3s. 5d., and leaving a balance of £3478 11s. 3d. to be carried to the next account. The Directors state that the improvement in the price of residuals has materially assisted in producing the increased dividend, which they hope will be maintained. The Engineer (Mr. W. H. H. Broadberry) reports that the whole of the works and plant have been maintained in good working order and repair, and the illuminating power of the gas has been kept above the prescribed standard during the past half year.

CROYDON COMMERCIAL GAS COMPANY.

The report which the Directors of the above Company will present to the shareholders at their meeting to-morrow opens with the satisfactory statement that the quantity of gas sold in the half year ending Dec. 31 last, compared with that of the corresponding period of 1887, shows an increase of 7,997,000 cubic feet, or 4·44 per cent. The revenue from the sale of gas is, however, less by £401, in consequence of the large reduction made in the price, notwithstanding which the Directors have decided further to lower the price to 2s. 11d. per 1000 cubic feet from the date of the next Lady-day quarter's accounts. This reduction, coupled with those made during the corresponding half year of 1887, will represent a saving to the consumers of about £6000 per annum. The revenue account shows receipts to the amount of £38,625, and an expenditure of £27,155; leaving a balance of £11,470 to be carried to the profit and loss account. The unappropriated balance amounts to £18,086, out of which the Directors recommend the payment of the standard dividends at the rate of 10 per cent. per annum on the capital of £51,600, and of 7 per cent. per annum on the capital of £137,500, and an additional dividend (under the sliding scale) at the rate of 4 per cent. per annum upon the several classes of shares—all less income-tax—for the half year ended Dec. 31, 1888. These dividends amount to £11,174, and will leave £6912 to be carried to the credit of the next half-year's accounts. In compliance with the resolution passed by the shareholders at the meeting held this time last year, the Directors have had under consideration the constitution and remuneration of the Board, and they recommend that as vacancies occur (by death or resignation), the number of the Directors be reduced to not less than six; and that the resolutions passed on Aug. 15, 1877, and March 1, 1882, respectively (for the payment to the Board of £1300 per annum, and of £100 extra per annum for every 1 per cent. paid in dividends above the standard rates of 10 and 7 per cent.), be rescinded, and that the following resolution be passed:—"That, from the 1st of January, 1889, each Director be paid a fixed sum of £200 per annum." The gas sent out from the works (which are under the management of Mr. J. W. Helps) has, according to the reports of the Gas Examiner for the Corporation of Croydon, been in every case satisfactory. The quantity of coal and cannel carbonized was 18,749 tons; the gas produced therefrom being 200,722,000 cubic feet. The residuals were: Coke, 224,988 cwt.; breeze, 29,595 cwt.; tar, 202,632 gallons; and ammoniacal liquor, 470,004 gallons, which yielded 160 tons of sulphate.

NEWCASTLE AND GATESHEAD GAS COMPANY.

The Annual General Meeting of this Company was held last Wednesday—Alderman HEDLEY in the chair.

The report of the Directors having been presented,

The CHAIRMAN, in moving the adoption of the report, remarked that the year to which it referred had been a very successful one to the Company. Gas was one of those things which required great care and attention in making; and he had, on his own part and on the part of others, to thank their Managers, both at Elswick and Redheugh, for the manner in which they had conducted the business during the whole of the past year. The revenue for the year had been £169,551, against £158,000 in the previous year; the expenditure, £103,840, against £100,206—showing the increase of the revenue to be £7029. This had been principally caused by additions under the heads of gas, £4345; coke, £1206; tar, £3834; sulphate of ammonia, £1079—total increase, £10,464 on these items. On Dec. 31, 1882, the price of gas was reduced to 2s. 1d. per 1000 cubic feet. The profit then was £42,884. On Dec. 31 last, with the gas at the same price, the profit was £59,999; being an increase of £17,115. From the 2s. 1d. they gave 10 per cent. discount to ordinary, and 15 per cent. to large consumers. In 1882 they paid a dividend of £39,403; and in 1888 they intended to pay £47,335—being an increase of dividend of £7932, as compared with six years ago. The interest on loans at that time was £6104. Last year it was £5703; being a decrease of £401. This was owing to their getting 3½ per cent. debenture stock. They were gradually reducing the 4 per cent. loans. In April last they sold £20,000 of new stock, for which they obtained £37,410, or a premium of £17,400. In 1887 their coal cost them 6s. 1¾d. per ton, average price. Last year the average price was 6s. 2¾d.; being ½d per ton more. These were about the two best years they had had in the purchase of coal. The total working cost, including coal, was 14s. 2d., against 14s. 3d. in the previous year—a saving of 1d. per ton. In 1888 the coal used was 146,932 tons, while in 1887 it was 140,493; being an increase of 6439 tons as compared with the previous year. The gas manufactured during the year would show the enormous production they had. The increase in the quantity made was 161 million feet. They had laid 17 miles of pipes, as against 17½ miles in 1887. The number of cooking-stoves in use now was 768, as against 812 in 1887. The Directors had decided to reduce the price of gas 1d. per 1000 cubic feet. By this reduction they brought the price down to 2s., which, less 10 per cent. to ordinary consumers, was about 1s. 9¾d.; and, less 15 per cent. to large consumers, from 1s. 9d. to 1s. 8d. for them. Their estimated loss by reducing the price was £7975, which included 5s. per cent. for the shareholders. To set against this they had a probable increase in the amount received for residuals. They also had to consider the electric light. There was an advertisement in the local paper that a company was now being formed to have the electric light for Newcastle. (A VOICE: Two companies.) Well, two companies. He, for one, did not anticipate that it would do them any harm; but, of course, it might. Many places would undoubtedly be lighted by electricity; but the gas that the electric lighting companies would use would nearly equalize matters. Therefore, he did not expect that there would be anything very serious to fear from the electric light. The profit on Dec. 31, 1871, was £22,886; in 1888 it was £59,999—or an increase of £37,113 in the 17 years. The dividend would be the same as before—at the rate of 9 per cent. per annum. In consideration of the greatly increased business of the Company, the Directors recommended that the salary of the Secretary (Mr. W. Hardie) be increased £100 per annum. The Secretary had been 34 years with them; and he thought he was quite entitled to the advance which the Directors recommended. He then moved that the report of the Directors be adopted, and that a dividend of 4½ per cent. for the half year ending Dec. 31, 1888, be declared.

Mr. W. B. WILKINSON seconded the motion, and it was carried.

The resolution for increasing the salary of the Secretary was then put and agreed to.

The SECRETARY returned thanks, and said he would do his best to forward the interests of the Company.

The CHAIRMAN moved a vote of thanks to the Managers of the works at Elswick and Redheugh, and to the officials of the Company generally, for their services during the past year.

The motion was carried unanimously.

The usual vote of thanks was accorded to the Chairman and Directors, and the proceedings closed.

WIDNES LOCAL BOARD GAS SUPPLY.

ADDITIONAL PLANT AT THE WORKS—THE WORKING OF THE DINSMORE PROCESS.

At the Meeting of the Widnes Local Board last Tuesday—Mr. F. H. Gossage, J.P., presiding—the Gas and Water Committee's minutes included a report by the Gas Engineer (Mr. Isaac Carr), in the course of which he said: "In consequence of the increased make of gas, the existing washing and scrubbing plant has become insufficient; and the quantity of ammonia remaining in the gas at this time of the year is considerably in excess of the limit. I would, therefore, recommend that a washer-scrubber of the rotary type, to pass 750,000 cubic feet per diem, be erected. The estimated cost, including foundations, valves, connections, and steam-engine, the whole erected complete, is £500. The Dinsmore process of carbonizing continues to work satisfactorily; the results of the working from Arley Mine nuts, without any cannel, from Nov. 29, 1888, up to the morning of the 4th ult. (a period of 68 days), ar as follows:—Coal carbonized, 185 tons; gas made, 2,274,000 cubic feet gas made per ton, 12,287 cubic feet; average illuminating power, 22·17 candles; quantity of tar used per ton of coal carbonized, 7 gallons. On the foregoing results, I beg to recommend that five more beds of retorts be altered from the ordinary to the Dinsmore principle—*i.e.*, one more bed in No. 2 retort-house, and the four new beds that it has been already decided to erect in No. 1 retort-house. This will then make a total of 36 mouthpieces, exclusive of the six secondary retorts, on the Dinsmore plan. With this arrangement, about one-third of the total coal used would be carbonized in the Dinsmore retorts, which would raise the illuminating power of the whole of the gas supplied to the town to 20 candles, and increase the make per ton very considerably. Herewith I submit a statement which, after deducting the tar used, &c., shows a balance in favour of this proposal over our present mode of working of £2192 per annum. The Committee recommended the adoption of the proposals.

Mr. GASKELL, in moving approval of the minutes, stated that at the time Mr. Carr was appointed Engineer, he pointed out that the plant was not sufficient. At great expense the plant was altered, and made so efficient that it had lasted up to the present time. This winter, however, they had found that their scrubbing power was insufficient; and in consequence they were using ammonia, which was a valuable bye-product that they could not afford to lose, as they could not sell gas at the present low rate without it. They therefore recommended the Board to purchase a washer-scrubber. They also recommended that five benches of retorts be constructed. At the present time they had one bench of retorts working on the Dinsmore process; and this enabled them to do without cannel coal. In June the contract would expire; and it was a question for them whether it should be renewed. By using another bench of retorts, they would be able to do without cannel. Between now and next winter they had to build four benches of retorts; and it was intended that these should be arranged for the Dinsmore process, which would enable them to make the whole of their gas of 20-candle power without increasing the cost. In fact, if present prices of bye-products were maintained, they would probably be able to reduce the price of gas 1d. per 1000 cubic feet. If they had to make gas of 20-candle power by the use of cannel, it would cost upwards of £2000 per annum more than by the Dinsmore process. He also pointed out that the new retorts would not cost any more than the old system of retorts, and that there would be an actual saving on the first cost.

Mr. WRIGHT seconded the motion, which was agreed to.

STREET LAMP ADVERTISING.—At the meeting of the Hammersmith Vestry last Wednesday, a letter was received from the Brentford Gas Company, forwarding copy of an agreement which they propose to enter into, by which they can have the privilege of placing an ornamental shield or escutcheon upon the public lamps in the parish, and offering the Vestry 2s. 6d. per lamp per annum as an allowance in the event of the Vestry's approval. The Vestry gave their consent to the proposal.

BRADFORD CORPORATION GAS SUPPLY.

The Working of the Department.

At the Meeting of the Bradford Town Council last Tuesday, Alderman Priestman gave some interesting figures regarding the operations of the Gas Department. The quantity of gas consumed during the half year ending Dec. 31 last, he said, had been 715,654,000 cubic feet, which was an increase of 5·78 per cent. as compared with the corresponding half of 1887. The largest daily consumption of gas was on Dec. 18, when the amount used was 8,123,000 feet. During the past year, almost for the first time, there had been no strain whatever during the dark days on supply. The sale of gas had realized £65,753, as compared with £62,717 for the corresponding half of 1887. For coke the receipts had been £8037, which was an increase of £934; for tar £4832, an increase of £1268; for spent oxide £1011, an increase of £127; for ammoniacal liquor £11,877, an increase of £1633. The rest of the items were pretty much the same; and the total revenue was £94,774, as compared with £88,069 for the corresponding half year of 1887. On the other side of the accounts, the expenditure on coal had been £34,344, as compared with £32,759; for repair of works, £2762, which was a decrease of £2100, and which was mainly accounted for by the fact that in the previous half year £1700 was expended on revenue account for the repair of one of the gasholders'; the repairing of the retorts had caused an increased expenditure of £600; and the lighting of the new lamps had cost £3332, as compared with £2732. There were now in the borough 7641 lamps, of which 6491 were ordinary and 698 Bray's lamps. Of these 116 were in the district of the Clayton Gas Company, 131 in that of the Shipley Gas Company, 48 in Ripleyville, and 157 in the Thornbury and Tyersal district. The payment for rates had been £2607, as against £2367. The other items were much the same. The amount transferred from revenue to sinking fund had been £4019; the interest on loans, £9839; and the bad debts were about £40 more. The result was a balance of profit of £12,592, as compared with £7763, or an increase of £4729. A reduction in the price of gas took place in July, 1887. The profits at the end of July, 1887, were £9070; and at the end of July, 1888, £5535. Adding the two half years of 1887 together, the profits were £16,833; while the profits for the two half years of 1888 were £18,127, or an increase for the year of £1300, notwithstanding the reduction in the price of gas. The amount of loans repaid from sinking fund had been £78,976; ordinary loans, £222,967; and debenture stock, £295,567—making £597,510. There was a balance still left of £25,576, which was used mainly for working capital. In addition £25,000 had been paid out of revenue from time to time to the restoration or maintenance fund, from which interest at 4 per cent. was placed to revenue account.

METROPOLIS WATER SUPPLY.

The returns furnished to the Registrar-General by the London Water Companies show that the average quantity of water supplied daily to the Metropolis during the past month was 156,769,477 gallons, against 155,792,903 gallons in the corresponding month of 1888. The number of houses served last month was 747,067, or 210 gallons per house, and 26·9 gallons per head of the population. In January, 1888, the number of houses supplied was 733,734; and the quantity of water allowed for each person 27·2 gallons. Of the entire bulk of water supplied last month, 76,854,783 gallons were drawn from the Thames, and 79,914,694 gallons from the Lea and other sources.

In his report to the Registrar-General on the quality of the Metropolitan Water Supply last month, Dr. E. Frankland remarks: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of the water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was: Kent, 0·5; Colne Valley, 1·3; New River, 1·5; Tottenham, 1·6; East London, 3·0; Lambeth, 4·2; Southwark, 5·0; Chelsea and West Middlesex, 5·1; and Grand Junction, 5·2. The Thames water sent out by the Chelsea, Southwark, and Grand Junction Companies again contained an increased quantity of organic matter, even beyond the somewhat large proportion present in the December samples. The Lambeth Company's water, however, exhibited an improvement in this respect; whilst the abnormally large amount found in the West Middlesex Company's water last month has been markedly reduced. The foul condition of the river has taxed the filters of the Companies to the utmost. Nevertheless the Chelsea, West Middlesex, and Lambeth Companies delivered water which was clear and transparent; but the Southwark Company's water was slightly turbid and opalescent, and that delivered by the Grand Junction Company turbid and opalescent. The organic matter in the Thames waters was less nitrogenous than in December. The water chiefly derived from the River Lea, and delivered by the New River and East London Companies, had greatly improved in quality since December, and contained a much smaller amount of organic matter than any of the Thames-derived waters. It was efficiently filtered by both Companies; and the New River Company's supply was, in respect of organic purity, about equal to some of the deep well water. The deep-well waters of the Kent and Colne Valley Companies, and of the Tottenham Local Board of Health contained, as usual, but a very small proportion of organic matter. The Colne Valley Company's water was softened by treatment with lime before delivery, and was thus rendered suitable for all domestic purposes."

Messrs. Crookes, Odling, and Tidy, in the course of their report to the Official Water Examiner for the Metropolis (General A. de Courcy Scott) on the quality of the daily samples taken of the water supplied to London during the past month, say: "The results furnished by the examinations of the water supplied to the Metropolis, made daily during the month of January, are extremely good, and indeed exceptionally good for the period of the year. Thus, in the case of the Thames-derived waters, for example, the mean proportion of organic carbon was found to be only 0·170 part in 100,000 parts of the water, with a maximum in any one sample examined of 0·197 part; this maximum result for January, 1889, being almost identical with the mean result, or 0·196 part, for the previous month of December, 1888. That this last mean result was not at all excessive for the period of the year, may be gathered from the consideration that even a proportion of 0·280 part of organic carbon in 100,000 parts of the water corresponds, as nearly as may be, to about ½ grain only of organic matter per gallon. Of the 189 samples of water examined, two of the Thames-derived samples were alone recorded as exhibiting a very slight turbidity."

Reductions in Price.—At the annual general meeting of the *Sleaford Gas Company*, held last Wednesday (when the usual dividend of 7 per cent. was delared), the Directors announced that as from the 31st prox. the price of gas would be reduced to 3s. 9d. per 1000 cubic feet, with discounts 5, 7½, and 10 per cent., according as the quantity consumed amounts to £10, £20 to £30, and above £30 per annum.——The *Charing Gas Company* have resolved to reduce the price of gas from 6s. 8d. to 6s. 10d. per 1000 cubic feet.——The *Nelson Local Board* have reduced the price of gas 3d. per 1000 cubic feet to all consumers, as from the 1st ult.

NOTES FROM SCOTLAND.

(from our edinburgh correspondent.)

Edinburgh, *Saturday*.

Now that both the gas and water undertakings in Edinburgh and Leith are in the hands of the Corporations, an attempt is to be made to get the establishments under one roof. Two years ago an endeavour was made by Sir Thomas Clark, then Lord Provost,, to obtain parliamentary sanction to reconstruct the Municipal Buildings, and to make provision for accommodating all municipal departments in one house. In view, at that date, of the gas transfer, it was understood that rooms were to be set apart for the Commission that was to be. But the scheme was defeated; and in lieu of it, there is now the lesser proposal to link the gas and water departments together. The new Waverley Hotel, which was formerly the General Post Office, has been found suitable; and it is probable that negotiations for its acquisition will soon be entered into.

At the meeting of the Perth Gas Commission on Monday, plans and specifications prepared by Mr. Whimster for two new exhausters and alterations upon the exhauster-house (part of the scheme of extension of the works) were approved of. The probable cost of the exhauster and engine is £500; and of the alterations upon the house £30.

It will be remembered that recently the Gas Company of Dalkeith undertook virtually to be good boys in future, and to look better after the quality of the gas. At a meeting of the Police Commission on Monday, a letter was read from the Secretary of the Gas Company, transmitting a letter from Mr. J. Falconer King, the City Analyst of Edinburgh, which stated that on Jan. 19, he tested the gas by the apparatus in the works at Dalkeith, and found the illuminating power to be 27·14 candles; that there was neither sulphuretted hydrogen nor ammonia present; and that the gas was of very good quality.

The Treasurer of the Turriff Gas Company has been driven in desperation to commit what to my mind is a foolish action. There is in the town a lodging-house, in which the Parochial Board keep indigent persons. On the strength of this, the Company have lodged a claim with the Board for £3 11s. 4d. for gas consumed between Dec. 24, 1885, and the 26th ult. The Treasurer, in making the claim, says he is not aware why the account should have been so long unpaid. The reason is that the house is not rented by the Parochial Board, who merely house their paupers in it. The Board is not on the books of the Gas Company at all; and they consequently repudiated liability for it—leaving the Company to take their redress against the tenant of the house. The transaction looks like a bit of sharp practice on the part of the Company, who, finding they cannot recover from the tenant of the house, are seeking to make the Parochial Board—a much more reliable party—their creditor. They had better have seen to that before supplying the gas they now charge for.

Messrs. Leslie and Reid, C.E., of Edinburgh, the Engineers to the Edinburgh and District Water Trust, have, in terms of the remit to them by the Trustees, prepared an exhaustive report on the proposed additional water supply. They state that since 1870 the daily consumption of water has risen from 8 to 15 million gallons, and that the population has increased from 254,000 to 370,000. They calculate that in the year 1900, the population may be 470,000; and the daily consumption, 18 million gallons. In order to provide this quantity of water, they consider it necessary to go beyond the basin of the Forth, from which the present supply is taken, and go to the basin of the Tweed. They put forward three schemes, all of which can be introduced by instalments, as circumstances require. The first they deal with is the Manor supply, which would yield 15 million gallons per day. The first instalment of 10 million gallons they calculate to cost £480,000. The second instalment, they estimate at £184,000; making a total for the whole scheme of £664,000. The second scheme is the head waters of the Tweed, including the Talla, Garneshope, Menzion, and Fruid waters. From these, they anticipate a yield of 24 million gallons per day, which might be taken in three instalments of 8 million gallons each. These they estimate at £510,000, £223,000, and £237,000 respectively, or £970,000 in all. The third scheme is St. Mary's Loch, from which they calculate that 36 million gallons could be drawn daily. This scheme they propose to introduce by instalments of 12 million gallons each, to cost £681,000, £244,000, and £140,000 respectively, or £1,065,000 in all. The St. Mary's Loch water would be conveyed from the Loch by a tunnel seven miles in length, to the Manor valley; and thus, in the event of their adopting the Manor scheme, the Loch supply could be taken in afterwards as an extension. The Manor scheme will itself require a tunnel about four miles in length, through the Leadburn range of hills. The Engineers propose to construct the tunnels, and build aqueducts, of a capacity sufficient to carry the whole supply; leaving the additions, to consist merely of laying additional cast-iron pipes. Beyond the estimates given above, there would, for all the schemes, require to be an extension of the filtering-beds at Alnwickhill, and of the distributing mains. The report is about to be issued to the Trustees; and the Works Committee are to meet next week to consider it.

(from our glasgow correspondent.)

Glasgow, *Saturday*.

At a recent meeting of the Glasgow Gas Committee's Sub-Committee on Works, the General Manager (Mr. W. Foulis) was authorized to obtain and submit tenders for a new station-meter for use at the Tradeston Gas-Works when the reconstructional operations now in progress have been carried out. Four firms—two Scotch and two English—have been asked to tender; and offers are now being received. The meter is to be capable of passing 120,000 cubic feet of gas per hour, running at the rate of 80 revolutions per hour. The pipes required for the same works are to be supplied by Messrs. R. Laidlaw and Sons; and the special castings by the Barrowfield Iron-Works, Limited, of Glasgow.

At the monthly meeting of the Coatbridge Town Council on Thursday, Provost Alexander, who was Chairman of the local Gas Company prior to the formation of the burgh, inquired how the action-at-law raised against the Council by the Gas Company now stood (*ante*, p. 249). Mr. Sharp, the Convener, replied that the Lighting Committee had had a meeting with the Directors of the Gas Company; and they had not been able to come to any mutual arrangement on the question at issue. The Provost asked if it was not a small matter; and Mr. Sharp admitted that it was so. The Town Clerk then explained that a joint minute had been drawn up, and agreed to by both parties, to the effect that the action should be dropped, neither party being liable in expenses. A minute had also been adopted in which both parties withdrew the imputations the one against the other. He (the Town Clerk) then wanted a system arranged by which the street lamps should be lighted. Mr. M'Lachlan, Solicitor for the Gas Company, required the terms stated; and that the lamps should be lighted simultaneously with the metered lamps. The Town Clerk had no objection to this being put in the minute of agreement, if the words were added "to which the Town Council had all along agreed." The Directors of the Company, however, would not allow this; and there the matter stood. Mr. Sharp had since written to the Company, stating that the lamps were to be lighted; and they had replied to the effect that the Council's proposals were agreeable to them if the Council's inspector

carried them out. Some discussion took place; and in the end, it was agreed to leave the matter in the hands of Mr. Sharp and the Town Clerk, and to go on with the case if they could not effect an agreement.

This day week the Glasgow Corporation 9 per cent. gas annuities changed hands at £284 10s. per share. On Monday the price advanced to £286; and on Thursday of this week, £286 per share was paid for an oddlot.

On Monday, at the monthly meeting of the Wishaw Police Commissioners, a motion was made to have the district of Craigneuk lighted by means of twenty oil-lamps; seeing that the proposal to extend the gas-mains into the district for public lighting has been over-ruled. The motion was rejected. The next phase of this vexed question will be a proposal that the inhabitants of No. 4 ward (including Craigneuk) be not required to pay full burgh rates, inasmuch as they are not getting full burgh privileges.

For sulphate of ammonia there has been a rather firmer inquiry this week; the quotations in this city yesterday being £12 5s. per ton f.o.b. at Leith, and £12 8s. 9d. at London.

The Glasgow pig iron market has been much stronger this week; and Scotch warrants after opening on Monday at 41s. 6d. cash per ton, advanced to 42s. 3d. on Tuesday, but closed yesterday a shade easier, with buyers offering 42s. per ton cash. In hematite and Cleveland iron, a good business has been done at 44s. 9d. to 45s. 1½d. per ton for the former; and at 34s. 4½d. to 34s. 10d. for the latter, the top quotations being buyers' prices at the close yesterday. No. 3 quality of Scotch special brands has been in unusually heavy demand this week; and this has had a very good effect on No. 1 iron, so that the current quotations in nearly all cases show an advance of 1s. per ton. There seems to be a general feeling that, as the season advances, the shipments of pig iron will become larger; certainly the tone this week is rather more hopeful.

No material change falls to be reported in respect of the local coal trade. Prices, however, are being well maintained; and there is a steady demand both for steam and household qualities. For the present the advance of miners' wages in Lanarkshire has been stopped.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 16.

Sulphate of Ammonia.—The market and position remain *in statu quo*. Beyond the continuing speedy removal of prompt parcels as they come on the market, and which pass principally into dealers' hands, there is not much stir in sulphate. Consumers, to a large extent, remain passive; the frost and snow during the past week having been conducive to a postponement of requirements. The tone at the close is very steady, and, at any rate, lower prices are for the present not within visible reach, while any increase of the demand would bring prices sharply to a higher level. The quotations to-day are £12 5s., buyers; makers mostly holding for higher values,

LONDON, *Feb.* 16.

Tar Products.—These have been easier in value during the week, more especially in benzole and anthracene. Pitch maintains its price, and considerable business has been done. Carbolic acid is stronger, and enquiries brisk. Prices may be taken as follows:—Tar, according to position, 18s. to 24s. per ton. Benzole, 90 per cent., 3s. per gallon; 50 per cent., 2s. 3d. Toluol, 1s. 5d. per gallon. Solvent naphtha, 1s. 2d. per gallon. Crude naphtha, 30 per cent., 1s. 1d. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 20s. to 25s. per ton. Carbolic acid (crude), 3s. 9d. per gallon. Cresylic acid 11d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4d. per unit; "B" quality, 1s. 2d.

Ammonia Products.—Sulphate of ammonia is still low, but has improved a little during the week. Prices may be taken as follows:—Sulphate of ammonia £12 2s. 6d. to £12 7s. 6d. per ton. Gas liquor (5° Twaddel), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £20 per ton; white, £26 10s. Sal-ammoniac, £32 per ton.

SUGGESTED ACQUISITION OF THE GAS-WORKS BY THE HUCKNALL HUTHWAITE LOCAL BOARD.—At a meeting of the Hucknall Huthwaite Local Board last Tuesday, a letter was read from the Gas Company with reference to a proposed sale of their property. It appeared that an extraordinary general meeting of the shareholders had been held, at which it was resolved to ask if the Local Board were disposed to purchase the whole of the plant as a going concern, as there was another proposal before the Company for a purchase; but the shareholders preferred the Local Board to take the affair into their own hands. The lowest price mentioned at the meeting for the purchase of the plant was £3000. It was decided to obtain full information before the next meeting of the Board.

YEADON WATER COMPANY'S BILL.—At a special meeting of the Guiseley Local Board yesterday week, held to consider the proposed Bill of the Yeadon Water Company, it was proposed by Mr. Robinson, and seconded by Mr. Brook—"That the Yeadon Water-Works Company be asked to amend clause 18 in their new Bill, so that they are allowed to supply water to the Guiseley Local Board or Authority only, if required." The Chairman moved, as an amendment, "That the Company be asked to expunge the clause in so far as it relates to the Guiseley Local Board district." Mr. Thompson, failing to induce Mr. Robinson to include the Guiseley Water Company as well as the Local Board in his motion, seconded the Chairman's proposition, which was ultimately agreed to.

BEYROUT WATER-WORKS COMPANY, LIMITED.—The annual meeting of this Company was held last Tuesday. The Directors' report for the year ending Sept. 30 last stated that the gross revenue for the year was £11,058, against £11,069 for the previous twelve months, there being an increase of £191 from house services, and a decrease of £202 from irrigation. The ordinary working expenses and depreciations, amounted to £4359, as compared with £4807—showing a saving of £448. The Company, it was stated, had sustained a loss by the defalcations of the cashier at Beyrout, the total amount of which had been ascertained to be £756. Against this the Directors hold certain property as security, the value of which, when realized, will be applied in diminution of this loss. A claim was made upon the Company during the year by the Turkish financial authorities, for payment of a tax of 1 per cent. upon the nominal capital of the Company, under a law passed since the formation of the concern. The Directors resisted the claim as far as they could, and ultimately settled the matter by a present payment of 1 per cent. on the bond capital, and an undertaking in respect of the share capital contingent upon the latter receiving a dividend. The report was adopted. The two Directors retiring by rotation (Messrs. J. Morris and E. Easton) were re-elected, as were also the Auditors (Messrs. E. Moore and Son). Consequent on the death of Mr. E. Edwards, the late Secretary of the Company, the Directors had appointed Mr. D. B. M'Lachlan to be Managing Director of the Company, and to perform the duties of Secretary. A resolution appointing Mr. M'Lachlan a Director was agreed to.

BISHOP AUCKLAND GAS COMPANY.—During the past year the Bishop Auckland Gas Company carbonized 3302 tons of coals; sold about 23 million cubic feet of gas, apart from that for public lighting, and obtained £639 net for the residual products. The Directors in their report recommended payment of dividends for the past half-year at the rate of 10 per cent. per annum on the original and 7 per cent. per annum on the additional capital—these being the largest dividends for a very long period. The price of the coal used, delivered in the works, appears to have been about 6s. 8d. per ton; and the fact is of interest as showing the cost in the centre of the Durham coal-field.

COLNE VALLEY WATER COMPANY.—The Directors of this Company, in their report for the six months ending Dec. 31 last, to be presented to the shareholders at their half-yearly meeting next Friday, express regret that the accounts show a slight falling off as regards the revenue; the profit having been £2835, as against £2902 in the corresponding period of 1887. This, they state, is mainly owing to a great waste of water that occurred during the last few months of the past year, and continued notwithstanding every effort having been made to trace it. A part of this waste has now been discovered; and the Directors are giving their earnest attention to a scheme for enabling them in future to detect and check more readily any loss that may occur in this way. The dividend and interest account shows a balance of £1714, after paying £1491 interest on preference shares and debenture stock, and transferring another £100 to the reserve account. Out of this balance the Directors recommend a dividend at the rate of 2½ per cent. per annum, which will leave about £357 to be carried forward.

BARNET DISTRICT GAS AND WATER COMPANY.—In the report of the Directors of this Company for the six months ending Dec. 31 last, which will be presented to the proprietors at the half-yearly general meeting next Friday, it is stated that the balance of the net revenue account is £10,832, out of which the Directors recommend the declaration of a dividend for the above-named period at the rate of 7 per cent. per annum on the "A" and "C" stocks, 6 per cent. per annum on the "B" stock, and £4 18s. per cent. per annum on the "D" (water) capital. Continued progress in the Company's business is reported. The price of gas to private consumers has been reduced 3d. per 1000 cubic feet (from 4s. 3d. to 4s.) as from the 5th ult. The sinking of the new well, and the erection of the new engine, pumping machinery, and engine-house, have been completed to the Directors' satisfaction; and the yield of water has fully realized anticipations. Accompanying the report are the accounts, prepared by the Secretary and Accountant (Mr. Alfred Lass, F.C.A.), and certified by the Auditors (Messrs. F. Lennard and A. G. Hounsham).

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p 332.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18½–19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p. c.	10	13–14	..	5 7 2
800,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	100	110–112	..	4 9 3
100,000	20	29 Nov.	10	Bahia, Limited	20	24–26	..	7 13 10
200,000	5	14 Nov.	7½	Bombay, Limited	5	6¾–7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	5¾–6¾	..	5 4 2
880,000	Stck.	14 Feb.	11½	Brentford Consolidated	100	228–228*	+1	5 3 1
125,000	,,	,,	8½	Do. New	100	163–168*	+½	5 4 3
220,000	20	13 Sept.	10½	Brighton & Hove, Original	20	43–45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	45–47	..	4 15 9
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	20–22	..	5 0 0
39,000	10	,,	8	Do. 7 p. c.	10	13¾–14¼	..	5 10 4
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	13¾–14¼	..	5 10 4
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107–110	..	5 9 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	26–28	..	5 0 0
550,000	Stck.	12 Oct.	13⅓	Commercial, Old Stock	100	265–270	..	5 1 10
180,000	,,	,,	10½	Do. New do.	100	214–219	..	4 18 2
180,000	,,	28 Dec.	4½	Do. 4½ p. c. Deb. do.	100	123–128	+2	3 10 3
557,320	20	13 Dec.	13	Continental Union, Limited	20	48–50	..	5 4 0
242,680	20	,,	13	Do. New '69 & '72	14	34–36	..	5 1 0
200,000	20	,,	10	Do. 7 p. c. Pref.	20	38–40	..	5 0 0
75,000	Stck.	28 Sept.	10	Crystal Palace District	100	205–215	..	4 18 0
234,060	10	30 Jan.	13	European, Limited	10	25½–26½	..	4 18 1
120,030	10	,,	13	Do. New	5	7½ 18–19	..	5 2 7
354,060	10	,,	13	Do. do.	5	12–13	..	5 0 0
5,468,600	Stck.	14 Feb.	13	Gaslight & Coke, A, Ordinary	100	257–261*	+2½	4 12 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	99–104*	+1	3 16 11
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	260–265*	+2	3 15 6
80,000	,,	,,	5	Do F, 5 p. c. Prf.	100	128–128*	+½	3 18 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	180–185*	+1½	4 1 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	170–175*	+1½	4 0 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	258–263*	+1½	3 16 1
1,061,150	,,	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	120–123	..	3 5 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	125–130	..	3 9 3
650,000	,,	,,	6	Do. 6 p. c. do.	100	174–179	..	3 7 0
3,600,000	Stck.	14 Nov.	10	Imperial Continental	100	210–214	..	4 13 5
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd	5	5–5¼	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	115–117	..	4 5 6
541,920	20	29 Nov.	6	Monte Video, Limited	20	19–20	..	6 0 0
150,000	5	29 Nov.	10	Oriental, Limited	5	9½–9¾	..	5 2 7
60,000	5	28 Sept.	7	Ottoman, Limited	5	6–7	..	5 0 0
166,870	10	16 Jan.	4	Pará, Limited	10	5½–6	..	6 13 4
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	104–107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	95–100	..	6 0 0
100,000	10	12 Oct.	10	San Paulo, Limited	10	15½–16½	..	6 1 2
500,000	Stck.	29 Aug.	16½†	South Metropolitan, A Stock	100	325–328	+3	4 19 1
1,850,000	,,	,,	12½†	Do. B do.	100	246–251	+2	4 16 7
141,500	,,	,,	13½†	Do. C do.	100	260–270	+5	4 18 1
630,000	,,	28 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137–140	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ntn, Orig.	5	11–13	..	4 4 0
				WATER COMPANIES.				
717,467	Stck.	28 Dec.	9	Chelsea, Ordinary	100	259–264	..	3 8 2
1,720,560	Stck.	12 Oct.	7	East London, Ordinary	100	207–210	+4	3 6 8
700,000	50	13 Dec.	9	Grand Junction	50	122–126	+1	3 11 5
708,000	Stck.	14 Feb.	10½	Kent	100	272–277*	..	3 15 9
1,043,800	100	28 Dec.	9	Lambeth, 10 p. c. max.	100	254–259	..	3 9 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197–202	..	3 14 3
200,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118–122	..	3 5 7
500,000	100	14 Feb.	12½	New River, New Shares	100	350–360*	+6	3 7 4
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	100	123–126	..	3 3 6
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	167–172	..	3 9 9
126,500	100	,,	6	Do. 7½ p. c. do.	100	161–166	..	3 12 3
1,155,066	Stck.	,,	10	West Middlesex	100	265–270	..	3 14 1

*Ex div

† Next dividend will be at this rate.

OPPOSITION TO THE CLEVELAND WATER BILL.—The Saltburn Local Board, at an extraordinary meeting held last Friday, decided to oppose the Bill promoted by the Cleveland Water Company to sanction an alteration of their rates and charges.

OPPOSITION TO THE EAST KENT WATER BILL.—The Sandwich Town Council have decided to oppose the Bill promoted by the East Kent Water Company, on the ground that its passing would embarrass any attempt to deal with the question of the Local Authorities concerned.

PROPOSED LIGHTING OF MOTTINGHAM WITH GAS.—A Committee of ratepayers has been formed to go into the details of lighting the parish of Mottingham, in the district of the Bromley Union, with gas. Mottingham is in the area of the South Metropolitan Gas Company.

THE NEW WATER SCHEME FOR COVENTRY.—At the meeting of the Coventry City Council last Tuesday, Alderman Matterson moved a resolution to confirm the one adopted at the previous meeting with regard to the proposed new water-works. Mr. Andrews objected to the Whitley portion of the scheme; but the resolution was eventually adopted.

ADVANCE OF STOKERS' WAGES AT THE SOWERBY BRIDGE GAS-WORKS.—The Sowerby Bridge Local Board decided last Wednesday to grant an advance of wages to the stokers at their gas-works. In a recent memorial, the men asked to be placed on the same terms, as to pay, hours of labour, &c.; as the Halifax stokers; and this has now practically been done.

PROJECTED EXTENSION OF THE ROCHESTER GAS-WORKS.—The Rochester, Chatham, and Strood Gas Company are about to construct additional works; and plans and specifications for a wrought-iron tank 132 feet in diameter by 27 feet deep, adapted to receive a gasholder of four lifts (although it is proposed to erect one of two lifts only at present) are being prepared.

THE COST OF THE BUXTON LOCAL BOARD WATER-WORKS.—The Buxton Local Board have lately issued a complete account of the cost of their water-supply works. It shows that the purchase-money to the Duke of Devonshire was £8840; parliamentary expenses and arbitration, £1714—together £10,554. The construction of the Hogshaw Reservoir entailed an outlay of £14,999; expenditure in lining the reservoir, £1951; expenditure in 1887-8 on the Hogshaw Reservoir, £7091—total £24,042. The expenditure on water-mains was £5879; and the other expenses, including land and spring at Lightwood, £1440, made the total outlay £43,368. The loans on this account amount to £44,905, less £4632, paid off to Lady-day, 1888. The balance of debt is thus £40,272. In addition to the above repayments, there is a credit-balance on the sinking fund of £1384.

NORTHERN COAL TRADE.—The northern coal trade during the past few days has been active; and there have been the settlement of several large contracts for steam coal, which have stiffened the market prices. Steam coal (best qualities) has advanced to 10s. 6d. for immediate delivery. The contracts for a large part of the supply for the Swedish State Railway has been allotted to one of the Durham coal-owners; the price being 9s. f.o.b. For gas coal the demand continues excellent; and for odd cargoes 8s. 6d. has this week been paid. A contract for some 20,000 tons for export has also been booked at 8s. by a Durham firm. The demand for gas coal for local use is now diminishing; but it is evident in the large towns there is still a more extended use than had been expected, and in some there is now an increase of about 10 per cent. in the consumption over that of a year ago. The household coal trade is much slacker; but there is a good demand for coal for manufacturing purposes. Coke is much firmer in price, and gas coke partakes in the advance.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

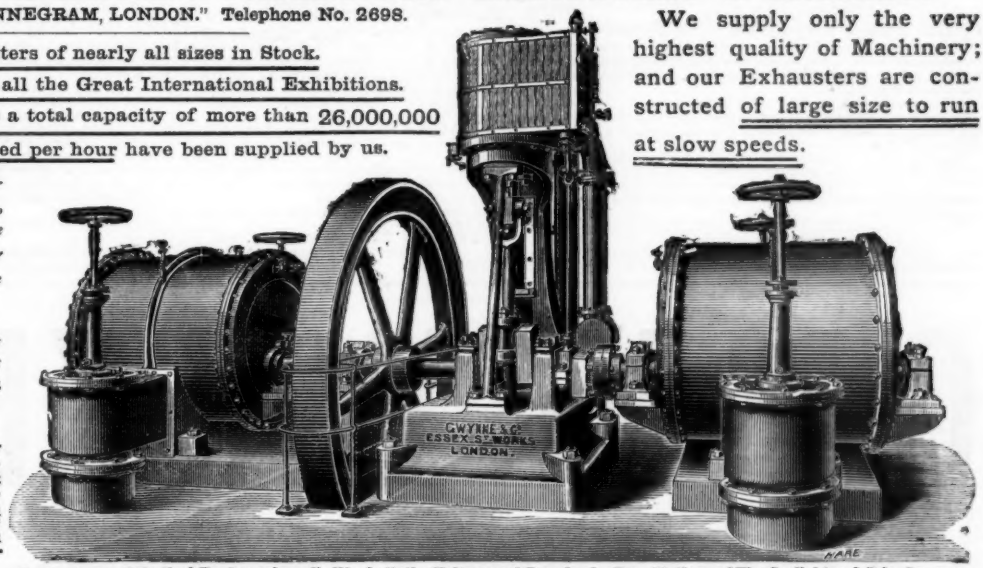
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 50, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
No. 54, BERNARD STREET, LEITH, }

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt, Delivered in carboys or railway tank waggons.
For prices and terms address BALE, BAKER, AND CO., 120 & 121, Newgate Street, LONDON.

THE GAS INSTITUTE.

THE Council respectfully request that all SUBSCRIPTIONS and COMMUNICATIONS relative to THE GAS INSTITUTE be addressed to Mr. William Longworth, Gas Offices, Guildford, who has been appointed Honorary Secretary, *pro tem.*
Dec. 29, 1888.

RAILWAY and Canal Traffic Act.— Oppose the Railways. Read comments by E. C. Rawlings, Solicitor. Price 1s.
Publishers: EVISON and BRIDGE, 22, CHANCERY LANE, W.C.

TIMMIS & CO., of STOURBRIDGE Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND Co, 68, Old Broad Street, E.C., Sole Agents for London and District. Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56, MILLBANK STREET, LONDON, S.W.
[Telegraphic Address: "PRECISION LONDON."]
Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gasholders and Meters, Registering and other Gauges, &c., &c.
*** See Advertisement on Page III. of the Wrapper of last week's issue.

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 361 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitrol. References given to Gas Companies.

WANTED, by a Total Abstainer, a Situation in a Gas-Works as WORKING MANAGER or FOREMAN. Has had good practical experience in Carbonising, Fitting, Main and Service Laying, Reading Meters, and Repairs connected with Gas Plant. Good testimonials. Married.
Address No. 1668, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Co.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.
Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries.
*** See large Advertisement in last week's issue, page 277.

WANTED, a Situation as Assistant in Gas-Works. Has had considerable and varied experience in Gas Manufacture, erection of Plant, Repairs, and Main Laying, &c. Practical knowledge of Chemistry. Would have no objection to the Colonies.
Apply, by letter, to No. 1677, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a total abstainer, a Situa- tion in a small Gas-Works, making from 4 to 8 millions, as WORKING MANAGER or FOREMAN. Has had Six years' experience; carbonizing over 3 millions, Main and Service Laying, Smithing, Reading Meters, and all repairs. Age 36; married.
Address No. 1676, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Second-hand Gas Purifiers, with Change-Valve and Pipes.
Particulars, stating price, &c., to be sent to the MANAGER, Allhusen's Works, South Shore, GATESHEAD.

DRAUGHTSMAN wanted, for a Gas Engineering Works. Must be expeditious, used to modern construction, and able to prepare working drawings.
Apply by letter, stating experience, age, and salary required, to No. 1674, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHIEF CLERK.

WANTED, by a provincial Gas Company, an experienced person as CHIEF CLERK. An intimate knowledge of the ordinary routine of a Gas-Rental Office, and of Book-keeping by double-entry, indispensable. Commencing salary, £160 per annum.
Applications, stating age, and enclosing copies of testimonials of recent date, to be sent to No. 1675, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., on or before the 6th of March next.

FOR SALE—5000 to 10,000 gallons of TAR.
Application to be made to the SECRETARY, Gas and Water Company, EAST GRINSTEAD.

FOR SALE—A good stout Wrought-Iron OIL-TANK, 7000 gallons, and three Cast-Iron 4-inch SOCKET ROSIN STILL WORMS, with Wrought-Iron Standards and Clips complete. To be immediately cleared for alterations of premises.
Apply to F. MORRIS, Tar and Rosin Distiller, Plough Bridge, Rotherhithe, LONDON, S.E.

BOLTON CORPORATION GAS DEPARTMENT.

TENDERS FOR TAR.

THE Bolton Corporation Gas Depart- ment are prepared to receive TENDERS for the Purchase of TAR to be produced at their Gas-Works, for the periods of One, Two, or Three years dating from the 25th of March next.
Approximate quantity 4000 tons yearly.
The Tar will be delivered into Contractors' Tanks at the Craddock Lane or Bullfield Sidings on the L. & Y. Railway, Bolton.
Tenders, under seal, endorsed "Tender for Tar," and stating price per ton of 2240 lbs., and terms, to be addressed to the Chairman of the Gas Department, and delivered at the Gas Offices, on or before Wednesday, the 27th inst.
The highest or any tender not necessarily accepted.
By order,
R. G. HINNELL, Town Clerk.
Town Hall, Bolton, Feb. 7, 1889.

OXIDE.

THE Gas Committee of the Heywood Corporation are prepared to receive TENDERS for the supply of 120 to 150 tons of BOG ORE, to be delivered at Broadfield Railway Station, Heywood.
Particulars can be had on application to the undersigned.
Tenders, endorsed "Oxide," to be delivered to the Gas-Works, addressed to the Chairman of the Gas Committee, on or before the 25th inst.
By order,
H. HAWKINS,
Feb. 14, 1889. Engineer and Manager.

SOUTHBANK AND NORMANBY GASLIGHT AND COKE COMPANY, LIMITED.

THE Directors of the above Company invite TENDERS for TELESCOPING a GAS-HOLDER 80 feet diameter by 20 feet deep.
Plans and specifications may be inspected and copied on application at the Office of the undersigned, to whom tenders must be sent on or before March 4 next.
The Directors do not bind themselves to accept the lowest or any tender.
WILLIAM NIXON,
Secretary and Manager.
Southbank, Feb. 18, 1889.

FARNWORTH AND KEARSLEY GAS COMPANY.

SPENT OXIDE.

THE Directors of the above Company invite TENDERS for the Purchase of about 120 tons of SPENT OXIDE.
Further particulars may be obtained from the undersigned.
Tenders to be addressed to the Chairman, and delivered not later than Saturday, the 23rd of Februar inst.
T. L. SHEPPARD, Manager.
Gas Office, Farnworth, near Bolton,
Feb. 5, 1889.

TENDERS FOR CANNEL COALS.

THE Llandudno Improvement Com- missioners invite TENDERS for a quantity not exceeding 300 tons of CANNEL COALS. Delivery between the 1st of March next and the 30th of September next, at the Llandudno Station of the London and North-Western Railway, carriage paid, in such quantities, and at such periods, as may be ordered from time to time.
Each person tendering, to state the approximate yield per ton, and also the illuminating power of the Cannel tendered for.
Sealed tenders, endorsed "Cannel," to be sent to the undersigned, not later than the morning postal delivery of Thursday, the 21st of February, inst.
The Commissioners do not bind themselves to accept the lowest or any tender.
T. T. MARKS, C.E., Engineer and Clerk to the Commissioners.
Llandudno, Feb. 4, 1889.

TENDERS FOR TAR.

THE Directors of the Wirksworth Gas- light and Coke Company, Limited, invite TENDERS for their Surplus TAR for One year, from the 1st day of April, 1889.
Delivery on Midland Railway, filled into Purchaser's Tanks.
Payments, cash monthly.
Sealed tenders, addressed to the Chairman, endorsed "Tender for Tar," will be received on or before the 28th day of February, 1889.
The Directors do not bind themselves to accept the highest or any tender.
Particulars may be had from
B. S. JONES, Manager and Secretary.

CORPORATION OF LEICESTER.
(AYLESTONE ROAD WORKS.)

CAST-IRON FLOOR-PLATES AND COLUMNS.
SECTION No. 2.—CONTRACT No. 11.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the Manufacture, Delivery, and Erection of CAST-IRON FLOOR-PLATES and COLUMNS.
Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which will be returned upon the receipt of a *bond fide* tender.
Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Cast-Iron Floor-Plates and Columns," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, March 9 prox.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, C.E.,
Engineer and Manager.
Gas Offices, Millstone Lane,
Leicester, Feb. 14, 1889.

CORPORATION OF LEICESTER.
(AYLESTONE ROAD WORKS.)

ROLLED STEEL JOISTS.
SECTION No. 2.—CONTRACT No. 12.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the Manufacture, Delivery, and Erection of ROLLED STEEL JOISTS.
Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which will be returned upon the receipt of a *bond fide* tender.
Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Rolled Steel Joists," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, March 9 prox.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, C.E.,
Engineer and Manager.
Gas Offices, Millstone Lane,
Leicester, Feb. 14, 1889.

C. & W. WALKER.

GASHOLDERS; PURIFIERS;

PURIFYING MACHINES;

CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;

SULPHATE & SULPHUR PLANT;

RETORT MOUTHPIECES; CONDENSERS;

LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;

SLIDE VALVES; TAR BURNERS; &C., &C.,

WOOD SIEVES.

ADDRESSES:

8, Finsbury Circus, London, E.C.; Midland Works, Donnington, Salop.

"FORTRESS LONDON," "FORTRESS DONNINGTON,"—Telegraphic.

The Subscription List will Open in London, Liverpool, New York, Boston, Philadelphia, and Baltimore, on Wednesday, the 20th, and Close on or before Friday, the 22nd of February, 1889.

Bankers in London:—Messrs. Lloyds, Barnetts, & Bosanquets Bank, Limited.
Do. Liverpool:—The Bank of Liverpool, Limited.
Do. New York, Do. Boston, Do. Philadelphia } Messrs. Brown Brothers & Co.
Do. Baltimore:—Messrs. Alexander Brown & Sons.

CITY OF BOSTON, U.S.A.

BOSTON UNITED GAS BONDS.

ISSUE OF 7,000,000 dols. (£1,400,000 STERLING),

Five per cent. Sinking-Fund Trust Bonds, being part of a total authorized issue of 12,000,000 Dollars, created by

THE BAY STATE GAS COMPANY OF NEW JERSEY.

The remaining 5,000,000 dols. will, as hereafter explained, be retained in the Company's Treasury until future developments in plant, or the purchase of additional property, necessitate their issue.

Dividends payable in Gold in New York and in London at Winchester House, at the exchange of 4s. 1½d. per Dollar.
Principal Redeemable in Gold at Par on Jan. 1, 1939.

Or earlier at the price of **105** New York, say **107½** London, subject to the provisions of the Sinking Fund mentioned below.*

These Bonds are created for the purpose of carrying out the purchase by the Bay State Gas Company, of the Gas Light Companies enumerated below (which comprise the total gas business of the City of Boston) and constitute a first lien and charge on the Stocks deposited for that purpose with the Mercantile Trust Company of New York.

THE TRUSTEES, EXECUTORS, AND SECURITIES INSURANCE CORPORATION, LIMITED, are authorized to receive applications for the above Bonds at the price of £98 per Bond of 500 dols., payable as follows:—

£ 5	per Bond of 500 dols.	on Application.
£25	" "	on Allotment.
£35	" "	on the 13th March, 1889.
£33	" "	on the 13th May, 1889.
£98	per Bond of 500 Dollars.	

with the option of making payment in full on Allotment, or on any Tuesday or Friday subsequent to the issue of Scrip Certificates, under discount at the rate of 4 per Cent. per annum.

The Bonds are to Bearer, and are of the denomination of 1000 dollars and 500 dollars each, with half-yearly Coupons attached, payable 1st January and 1st July in each year; the first Coupon, due 1st July, 1889, for interest on the instalments will be attached to the Scrip.

The Interest is payable, in Gold, at the option of the Holder, in New York or in London at the exchange of 4s. 1½d. per dollar.

* It is provided that after the 1st January, 1894, a cumulative **Sinking Fund** of 1 per cent. per annum shall be employed in the purchase of the Bonds at a price not above 105 per cent. in America, equal to about 107½ in London, but if the required amount in any year should not be obtainable by tender or purchase, the Bonds for redemption shall be drawn in New York, in the presence of a Notary, on the 1st May in that year, and paid off out of that Fund at 1050 dols. per Bond of 1000 dols.

The Company reserves to itself the right to increase the Sinking Fund at any time.

For the security of Investors, the Bearer Bonds may be converted into Registered Bonds, in sums of not less than 5000 dols., at the office of the Mercantile Trust Company in New York.

BOSTON UNITED GAS BONDS.

The gas supply of the City of Boston and its suburbs in the State of Massachusetts is furnished by 14 separate and independent Companies, 13 of which are absolutely restricted, each to its own specified and distinct district; while the fourteenth (the Bay State Gas Company of Boston) is by its Charter privileged to extend its operations into any part of the City. This Company is thus in a position to compete with any of the existing Companies or to assist their supplies from its own retorts.

The Companies proposed to be acquired for the purposes of the foregoing security are:—

1. Boston Gaslight Company.
2. Brookline "
3. Cambridge "
4. Charlestown "
5. Chelsea "
6. Dorchester "
7. East Boston "
8. Jamaica Plain Gaslight Company.
9. Malden and Melrose Gaslight Co.
10. Newtown and Watertown Co.
11. Roxbury Gaslight Company.
12. South Boston "
13. Waltham "
14. Bay State Gas Company of Boston.

And before the present issue was decided upon the accounts of these Companies were submitted to Messrs. Deloitte, Dever, Griffiths, and Co., Chartered Accountants, of 4, Lothbury, London, who certify that, notwithstanding the very conservative policy hitherto pursued, the united net profits now amount to 749,888·75 dols. per annum.

In addition, Mr. H. E. Jones, M. Inst. C.E., M.I.M.E., the Engineer of the Commercial Gas Company, Stepney, London, and other similar important Companies, whose experience in the transfer of Gas properties has been most extensive, was specially employed to examine and value the respective plant and works of these Companies in Boston. **He reports that the united commercial value of the undertakings at the present time is not less than £2,590,000 sterling, exclusive of the Bay State Gas Company.**

Of these Companies the Bay State Gas Company of New Jersey has practically acquired the entire interest in the following:—

	Dols.
Boston Gaslight Company, valued by Mr. Jones at	6,480,000·00
Roxbury Gaslight Company " "	1,314,903·00
South Boston Gaslight Company " "	579,420·00
Making a total security (in addition to the assets of the Bay State Gas Company) for the Bonds now offered of . . .	8,374,320·00

with a net income certified at 401,319·30 dols., but which, according to the report made by Mr. Jones, should be stated at 465,238·00 dols. in consequence of the large amount charged by the Boston Gaslight Company against income in respect of betterments.

Taking the latter figures and deducting the amount needed to pay interest on this issue—350,000 dols.—there will be a surplus on net revenue account of 115,238 dols., which should be considerably increased by the diminution in the cost of manufacture and administration, coupled with the extended use of Water Gas, to be supplied by the Bay State Gas Company of Boston. In addition, there will be the revenue of this Company, which, like the value of its plant, has not in the foregoing been taken into calculation.

These three Companies carry on 75 per cent. of the total gas business of the City of Boston, although, as their charge for Gas is lower than that of some of the other Companies, their net income is not 75 per cent. of the net profits certified to by the Accountants. Negotiations are now pending for the acquisition on favourable terms of the other ten Companies (which are comparatively small); and when these are completed a further issue of Bonds will be made. But by arrangement with the Mercantile Trust Company of New York, it has been provided that, whilst further issues of 5,000,000 dols. may be made in blocks of 1,000,000 dols. or more at a time, this can only be done against the certificate of the Trust Company that security to the extent of one-third of the value of the remaining Gas Companies, as fixed by Mr. Jones, has been lodged with them for each 1,000,000 dols. to be issued.

As to the final 2,000,000 dols. of Bonds, it is agreed that in no case can they be issued for twelve months, and then only on the certificate of Messrs. Brown Brothers & Co. that in their judgment a sufficient amount of additional security to justify the issue has been lodged with the Trust Company.

All the Gas Companies in Boston, with two exceptions, manufacture exclusively Coal Gas; the Bay State Company produces Water Gas only; and the Charlestown Company supplies a mixture of Coal and Water Gas.

Water Gas is the product of the decomposition of Water into its elements, rendered luminous by the addition of the gases of Naphtha or Crude oil—a process which has long been in operation throughout the United States. It is manufactured at a great saving in cost, and is of improved quality as compared with Coal Gas for the purposes of lighting and heating.

The Water Gas plant owned by the Bay State Gas Company of Boston is reported to be the finest in America, and to have been erected at a cost of over 2,000,000 dols.

The amalgamation of the various Companies (practically absorbing the whole gas business of the City of Boston) will cause a large reduction in the costs of administration, manufacture, and distribution, and the increased admixture of Water Gas with Coal Gas should still further reduce the prime cost of this illuminant. The most economical plan for concentrating these concerns under one administration has been found to be by the purchase of the stocks of the various Companies, and the Bay State Gas Company of New Jersey has obtained the necessary powers under its Charter for that purpose.

Messrs. Brown Brothers & Co., of New York, Boston and Philadelphia, have consented to act as Bankers for the purchase and deposit of these Stocks with the Mercantile Trust Company of New York on the terms of a Trust Deed which has been prepared by Messrs. Cary and Whitridge, Counsellors at Law, New York, so as fully to protect the security of these Bonds. Under this Deed, holders of Bonds will be entitled to five votes at all general meetings for every 1000 dols. held, and two Directors of the Boston Gaslight Company will be invited to remain in the interests of the Bondholders.

The Subscription List will be opened on Wednesday, the 20th, and closed on or before Friday, Feb. 22.

Where no allotment is made the deposit will be returned in full.

The failure to pay any instalment when due will render all previous payments liable to forfeiture.

Provisional Scrip Certificates to bearer, with first Interest Coupon attached, will be issued without delay, and Bonds of 1000 dols. and 500 dols. will be delivered in exchange, when ready.

Application will be made for a quotation and settlement on the Stock Exchanges of London, New York, Boston, and Philadelphia.

Copies of the Prospectus and forms of application can be obtained at the Offices of The Trustees, Executors, and Securities Insurance Corporation, Limited, Winchester House, Old Broad Street, E.C., of their Bankers, Messrs. Lloyds, Barnetts, and Bosanquets Bank, Limited, Lombard Street, and of Messrs. Hass and Sons, 3, Throgmorton Avenue, E.C., Agents of the Bay State Gas Company of New Jersey, in London; and in Liverpool of the Bank of Liverpool, Limited.

The original Reports, Drafts of the Bond, and Copy of the Trust Deed, &c., can be seen at the Offices of Messrs. Paine, Son, and Pollock, 14, St. Helen's Place, E.C.

Applications will also be received and forwarded to London by cable; and simultaneous allotments made in New York, Boston, and Philadelphia through Messrs. Brown Brothers & Co., Bankers to the Trustees, Executors, and Securities Insurance Corporation, Limited. Prospectuses may be obtained, and copies of the Trust Agreement inspected, at the Offices of Messrs. Brown Brothers & Co., 59, Wall Street, New York City, 66, State Street, Boston and Chestnut Street (corner of Fourth Street), Philadelphia; and of Messrs. Alexander Brown and Sons, Baltimore. Subscriptions in the United States to be at the parity of the sterling price, namely, 96 per cent. per Bond of 500 dols.

WINCHESTER HOUSE, LONDON, E.C., Feb. 19, 1889.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that the Half-YEARLY ORDINARY GENERAL MEETING of the Shareholders in the Company, will be held at the Company's Offices, Willoughby Lane, Tottenham, on Saturday, the 23rd day of February inst., at Three o'clock in the Afternoon precisely, to receive the Report of the Directors, the Statement of Accounts for the half year ended the 31st of December, 1888, to declare Dividends, and to transact such other Business as the Act of Parliament directs.

The Transfer Books will be closed on Saturday, the 9th, until the 25th inst., both days inclusive.

The Dividends to be declared will be payable on and after the 2nd day of March next.

By order of the Board,
JAMES RANDALL, Secretary.

Offices of the Company, Willoughby Lane, Tottenham, Feb. 8, 1889.

BOROUGH OF DEWSBURY.

THE Gas Committee invite Tenders for the Supply of RETORTS, FIRE-BRICKS, &c.

Particulars of quantities and forms of tender, may be obtained from Mr. Henry Townsend, Engineer and Manager, Savile Town Gas-Works, Dewsbury.

Sealed tenders, endorsed "Tender for Retorts," to be sent to me, the undersigned, not later than Saturday, the 23rd inst.

The lowest or any tender will not necessarily be accepted.

By order,
TREVOR C. EDWARDS, Town Clerk.

Town Clerk's Offices, Feb. 7, 1889.

MORLEY GAS COMPANY.

SPENT OXIDE.

THE Directors of the above Company invite TENDERS for the purchase of about 120 tons of SPENT OXIDE.

Further particulars may be obtained from the undersigned, to whom tenders must be sent in not later than Saturday, the 2nd of March.

J. HEMINGWAY, Secretary.

Gas Office, Morley, near Leeds, Feb. 16, 1889.

NOTICE.

Gas & Water Cos.' Directory, 1889.
Gas & Water Cos.' Statistics, 1889.
Water-Works " 1889.

Will Officials of Gas and Water Companies kindly fill up and forward AT ONCE the Form of Return sent them?

POSTAGE WAS PREPAID.

C. W. HASTINGS (Editor).

TELESCOPIC EXTENSION LADDERS & STEPS. | All sizes, many patterns, large stock for all purposes, indoor and outdoor. Admirable inventions.

HEATHMAN & CO.,
2, Endell St., & 11, High St., Bloomsbury, London, W.C.

THE ONLY RELIABLE

DRY CENTRE-VALVE.

WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.

ALSO MADE FOR TWO OR THREE PURIFIERS.

No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.

Write for Prospectus.

ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.

F. WECK, 86, NEW STREET, BIRMINGHAM.

GAS AND WATER PIPES.

1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

TROTTER, HAINES, & CORBETT,

BRETTELLS' ESTATE

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICK,
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

IMPROVED RETORT SETTING.

W. G. WALLER & Co.,

RETORT SETTERS & CONTRACTORS,

Having had much experience in the Setting of Retorts, beg to call the attention of Gas Engineers and Managers to their Improved System of Setting Retorts and Tar-Furnaces.

Contractors for Building Shafts, Tanks, Retort Benches, and all other Buildings connected with Gas-Works.

Estimates on application.

The Poplars, Waddon, Croydon, Surrey.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON N.,

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

A 10-H.P. BOILER

KEPT PERFECTLY CLEAN FOR

ONE SHILLING PER WEEK

And much smaller Coal Bills. Softens the Hardest Water, and keeps Gauge-Glasses quite clear.

H. CLARKE & Co., Ld., Ipswich.

GAS COAL.

POPE & PEARSON, LTD.,

have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12¼ cwt. of good coke.

This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

THOMAS ILLINGWORTH,

NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,

MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE Purchased for Cash against Delivery.

To effect a great saving in
GAS-FURNACES use our
Special Derbyshire **GANNISTER BRICKS.**

ADDRESS
JAMES WHITE & Co.,
ALBERT WORKS, WIDNES.

COKE BREAKERS,

FROM £14 EACH.
(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, S.E.

MARQUIS OF LOTHIAN'S

NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

MR. JOHN MORISON,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

CAST-IRON PIPES

FOR GAS AND WATER.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

THOMAS TURTON AND SONS, LIMITED,

SHEAF AND SPRING WORKS
SHEFFIELD,
MANUFACTURERS OF

FILES OF BEST QUALITY FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNER RATCHET BRACES, LIFTING-JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:
90, CANNON STREET, E.C.

PATENT
ARTIFICIAL PEROXIDE OF IRON,
LUX MASS,
IN USE AT
BERLIN, VIENNA,
PARIS, COPENHAGEN, STOCKHOLM,
BUCHAREST, &c., &c.

FRIEDRICH LUX,
142, GREAT PORTLAND STREET,
LONDON, W.

THE
LANEMARK COAL Co., LTD.,
Now offer their superior
GAS COALS

LANEMARK CANNEL.
Yield of Gas per ton . . 10,880 cub. ft.
Illuminating Power . . 29·21 candles.
Coke per ton . . . . 1266·96 lbs.

LANEMARK GAS COAL.
Yield of Gas per ton . . 11,379 cub. ft.
Illuminating Power . . 17·88 candles.
Coke per ton . . . . 1285·53 lbs.

LANEMARK GAS BRIQUETTES.
Yield of Gas per ton . . 10,734 cub. ft.
Illuminating Power . . 22·70 candles.
Coke per ton . . . . . 1320 lbs.

For Prices and Analyses apply to
LANEMARK COAL Co., Ltd.,
NEW CUMNOCK, N.B.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD
CANNEL.
Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP
GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on application.

Jos. EVANS & SONS
WOLVERHAMPTON.
PUMPS
FOR
STEAM AND OTHER POWER.

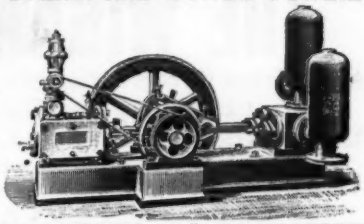


Fig. 685.—EVANS' Patent "RELIABLE" REVERSIBLE TAR and LIQUOR PUMP. In use everywhere. The Best in the World.

Fig. 600.—EVANS' Patent "CORNISH" DIRECT-ACTING STEAM-PUMP. FOR EVERY PURPOSE.

SEE NEW CATALOGUE.

SIXTH YEAR. Now Ready (Demy 8vo., Price 5s., or 5s. 6d. post free),
THE COMPLETE REPORTS OF THE PROCEEDINGS
OF THE VARIOUS
DISTRICT ASSOCIATIONS OF GAS MANAGERS
FOR 1888.
FORMING A COMPANION VOLUME TO THE TRANSACTIONS OF THE GAS INSTITUTE, WITH WHICH IT IS UNIFORM IN SIZE
. THE VOLUMES for 1883 to 1887 ARE STILL ON SALE.
LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

D. HULETT & CO. Invite attention to the following Specialities:—
PATENT STREET LAMPS,
NO PUTTY OR OTHER MATERIALS ARE REQUIRED TO SECURE THE GLASS. PRICE 9s. 9d. EACH NET.
D. Hulett's Improved Service Cleanser, for the removal of Naphthalene and other obstructions in Service-Pipes. Price 70s. net.
IMPROVED HIGH-POWER LANTERNS; PRICES ON APPLICATION.
Patentees of Improved Wet and Dry Gas-Meters.
Makers of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.
SHOW-ROOM AND WORKS: 55 & 56, HIGH HOLBORN, LONDON.

Glass-House Furnace Bricks.
BLAST-FURNACE BRICKS.
Best Staffordshire Blue Bricks.
Please address "MOBBERLEY & PERRY, STOURBRIDGE," as there are other Firms similar in name.

FIRE BRICKS: GAS RETORTS
LARGE STOCKS ON HAND
SILICA BRICKS & BLOCKS FOR INTENSE HEATS
CASTINGS & EVERY REQUISITE FOR GAS WORKS
LARGE STOCKS ON HAND
MOBBERLEY & PERRY
STOURBRIDGE
SPECIAL BRICKS FOR SECONDARY AIR SUPPLY & REGENERATOR FURNACES
EXPERIENCED RETORT-SETTERS SENT TO ALL PARTS OF THE KINGDOM

BLOCKS, LUMPS, AND TILES,
Boiler Seatings, and Flue Covers
Best Glass-House Pot & Crucible Clay.
Please address "MOBBERLEY & PERRY, STOURBRIDGE," as there are other Firms similar in name.

HISLOP'S PATENT
GAS PRODUCER AND REGENERATIVE SYSTEM OF HEATING RETORTS.

The Patentee's Settings on the Shallow Sunk Chamber Plan,
AND OF FROM
One to Eight Retorts per Oven,
Are at once the most inexpensive and efficacious that can possibly be devised, and are giving absolute satisfaction where in use. By a new an improved means, the Producers of all Settings are now filled directly from the Retorts.

Particulars from the Patentee's Agent for England, J. E. FISHER, Esq., Stourbridge, or from the Patentee,
G. R. HISLOP, F.C.S., &c., Engineer, GAS-WORKS, PAISLEY, N.B.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
MIDLAND DISTRICT OFFICE: 22, TEMPLE STREET, BIRMINGHAM—AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN, BIRMINGHAM." TELEPHONE No. 200.

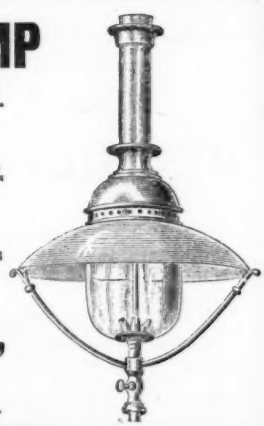
CAST-IRON PIPES, ETC.
THOMAS SPITTLE, LTD.
[ESTABLISHED OVER 50 YEARS.]
CAMBRIAN FOUNDRY, NEWPORT, MON.,
MAKERS OF
CAST-IRON PIPES FOR GAS, WATER, AND STEAM
ALSO
Retorts Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.
ALSO ALL WROUGHT-IRON WORK.
THE LARGEST MAKERS IN WALES.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

THE SCHÜLKE REGENERATIVE LAMP
FOR DOMESTIC AND EXTERNAL LIGHTING.
The only Generative Lamp employing the common flat flame burners.

Lamps giving 20-Candle Power consume less than 4-feet of Gas per hour.

A PURE WHITE AND PERFECTLY STEADY LIGHT NOT AFFECTED BY DRAUGHTS.
Suitable for any existing fittings (brackets or suspending). Can be fixed in a few minutes
May be seen at the Offices of the
SCHÜLKE GAS-LAMP COMPANY, LTD.,
ROOM 446—11, QUEEN VICTORIA ST., LONDON, E.C.,
WHERE PRICE LISTS AND FULL PARTICULARS MAY BE OBTAINED.



Specialities.

THE "NUGENT" RECUPERATIVE RETORT SETTINGS AND FURNACES.

"ROBUS" IMPROVED RETORT SETTINGS, WITH COKE, TAR, AND BREEZE FURNACES.

The above Settings and Furnaces are proving eminently satisfactory.

Every Particular, with Estimates, forwarded upon Application to
MESSRS. J. & H. ROBUS,
CONTRACTORS FOR THE ERECTION OF GAS & WATER WORKS,
37, WALBROOK, LONDON, E.C.

WEST'S GAS IMPROVEMENT CO., LIMITED,

Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **140** MACHINES AT WORK.

ADVANTAGES ATTENDING ITS USE ARE:—

INCREASED VOLUME of GAS per TON and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE per Ton** of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by **Wire Rope, Steam, or Compressed Air.**—The power machines are applicable to circular, oval, or ⌂-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

Sole Makers of **CIRCULAR, OVAL,** or ⌂-shaped **MOUTHPIECES,** with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and as the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

Estimates and further particulars forwarded upon application for Mouthpieces complete, or for Lids and Fastenings separately.

MAKERS OF THOMAS AND SOMERVILLE'S COKE-BREAKING MACHINE.

SOLE MAKERS OF WHITE'S PATENT AUTOMATIC GAS-VALVE.

Mr. JOHN WEST, M. Inst. C.E., Managing Director.

ILLUSTRATED CATALOGUE SENT UPON APPLICATION.

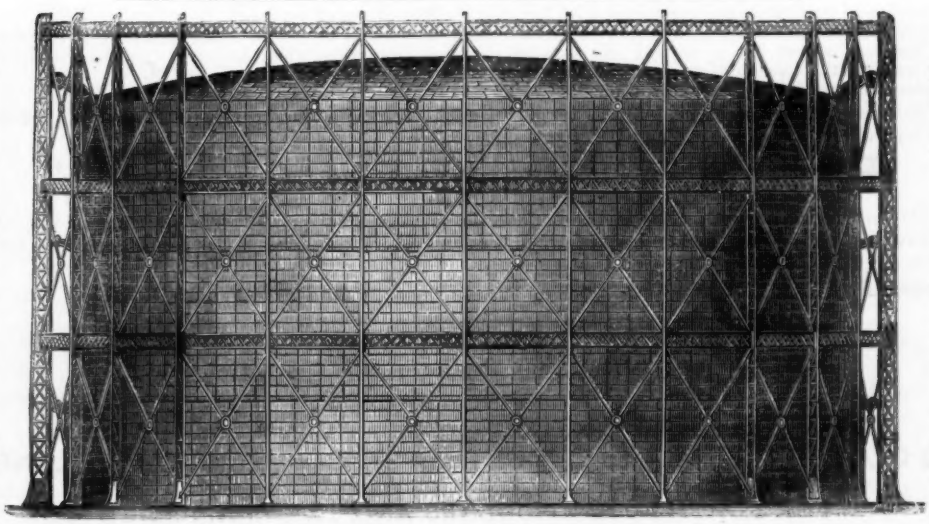
W. C. HOLMES & CO.,

ENGINEERS & CONTRACTORS FOR GAS-WORKS,

WHITESTONE IRON-WORKS, HUDDERSFIELD,

And 80, CANNON STREET, LONDON, E.C.

GASHOLDERS OF **Improved Construction.**



Tar, Sulphate, Muriate, AND **Liquid Ammonia Plants.**

MAKERS OF

IMPROVED CONDENSERS, SCRUBBERS, AND WASHERS;

PURIFIERS with PLANED JOINTS; CENTRE-VALVES TO WORK ALL FOUR PURIFIERS; EXHAUSTERS,

AND ALL APPARATUS and FITTINGS used in GAS MANUFACTURE.

HOW TO SECURE THOUSANDS OF SMALL CONSUMERS OF GAS ALL OVER THE WORLD.

In these days there is a desire to save labour in every possible form, and the application of Automatic Machinery to all kinds of purposes proceeds with leaps and bounds.

The extension of Gas supply and the requirements of Small Consumers have had their effect upon the Inventors of Automatic Machinery.

Brownhill's "Prepayment Gas-Meter"

Is a ready means for the Small Consumer to pay for his Gas in advance, and in small quantities, either daily, weekly, monthly, or at any given period in which a certain quantity will be required.

The result is a great benefit to the consumer, as he has no calls, dunning him for the "Money for the Gas," from collectors; if he has used his ONE PENNY'S WORTH, he can always drop in another PENNY without asking anyone. Has no fear of having his "Gas Cut Off," pays as much as he likes, consumes what he pleases, and is in every sense his own master, so far as Gas supply is concerned.

To Gas Companies and Gas Committees

Brownhill's "Prepayment Gas-Meter"

Offers enormous facilities for the extension of Gas supply, especially to Small Consumers. Statistics show that there are 50 per cent. non-consumers situated along the lines of Gas-Mains in districts where there is a good supply at the door. No expensive system of collection has to be adopted; and the cash is paid always before the Gas is consumed. Gas suppliers must look to the consumers of small quantities of Gas to increase the consumption of Gas. If

Brownhill's "Prepayment Gas-Meter"

be adopted, a blow will be directed at the dangerous use of mineral oils, by which 800 lives are annually lost within the United Kingdom. The artisan class will have a safe light always at their command; and they will find Gas cheaper, cleaner, and more wholesome than any oil in the market.

DESCRIPTION OF METER.

This Patent is a small attachment which can be applied to all Meters, new or old, and which will deliver gas in quantities as paid for by pence deposited in a box.

The attachment is made so that only one penny at a time can be put into the box. Although 143 pence can be put in consecutively, each penny will pay for sufficient gas for one burner, to last between six and eight hours. When a gas consumer pays a penny or any number of pence into the meter, the action of the meter will be at once operated upon to a proportionate extent. A dial will also at all times indicate the amount paid for, and not used. The light will diminish a quarter of an hour before the gas paid for is actually used up; thus giving notice that a further payment is required.

The object of the "Prepayment Gas-Meter" is to place the consumption of gas as easily within reach of the mass of the population as petroleum, candles, &c., so that it may be purchased even a pennyworth at a time, and without any initial outlay or trouble, such as deposit, reference, or guarantee, now required by the Gas Companies. The increased light and many conveniences of gas would thus be obtained economically; and the great danger from petroleum and benzoline, and the disagreeable smell from cheap lamps and oil, obviated.

An important consideration, which cannot be overlooked, is the duty of Gas Companies and Corporations, who have a first-class monopoly, to supply the working classes with gas, without the burden and restrictions which now exist.

It is anticipated that there will be a great demand for these Meters in houses of all classes, especially in those with rents ranging from £13 to £50 per annum, as it will be a great advantage to these occupiers to pay for their gas only as it is required, as for other household goods. **Occupiers will thus be able to control their weekly expenditure of Gas, and to check leakages and waste.**

The Meter will be in demand for—

(1) Sub-tenancies in large manufacturing premises where each sub-tenant has to pay for gas. This is a large class, both in London and the provinces.
(2) Stable and yard purposes, connected with hotels and other places of business.
(3) Householders generally, as, by using this attachment, caretakers or servants will only require pence to obtain their gas, and cannot use it beyond the amount paid for; and thus when houses are left in charge of caretakers or servants the consumption of gas would be controlled.
(4) Rooms or premises let for entertainments by day or week.

Messrs. Sommerville & Co., of 17, Temple Street, Birmingham, are now prepared to enter into Contracts with Gas Companies, Corporations, Local Boards, and Others for the supply of

Brownhill's "Prepayment Gas-Meter,"

and with Gas-Meter Manufacturers, for the right to adopt the prepayment principle. The system is an unqualified success. The meters have been examined by hundreds of Engineers and others interested in Gas supply, and have been favourably reviewed in the

"Journal of Gas Lighting," "Gas World," "Gas and Water Review," &c., &c.

PATENTEE:
R. W. BROWNHILL, Aston, near BIRMINGHAM.
MANUFACTURERS:
W. PARKINSON & Co., Cottage Lane, City Road, LONDON.
THOMAS GLOVER & Co., 214 to 222, St. John St., Clerkenwell Green, LONDON, E.C.

FOR FURTHER PARTICULARS AND TERMS APPLY TO

SOMMERVILLE & CO.,
17, TEMPLE STREET, BIRMINGHAM.

THE

"PERFECT" CONDENSER

(MORRIS & CUTLER'S PATENT).

The most successful Condensing Apparatus in the Market.

OVER 50 IN OPERATION.

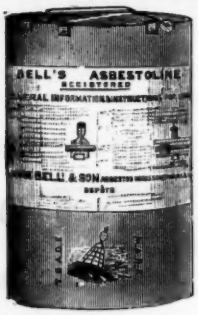
SUITABLE EITHER FOR LARGE OR SMALL WORKS.

SAMUEL CUTLER & SONS,

CONTRACTING GAS ENGINEERS,

Millwall, London.

BELL'S ASBESTOLINE.

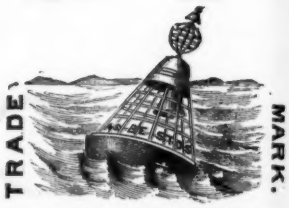


All kegs are labelled as above.

REGISTERED.

ADVANTAGES OF ASBESTOLINE.

ASBESTOLINE is the most efficient Lubricant for all bearings.
ASBESTOLINE is the cheapest Lubricant.
ASBESTOLINE saves from 50 to 90 per cent. of the Cost of Oil.
ASBESTOLINE is the Cheapest Lubricant.
ASBESTOLINE is favoured by Insurance Companies.
ASBESTOLINE is the most Inodorous Lubricant.
ASBESTOLINE is the safest Lubricant from Ignition.
ASBESTOLINE has beaten all other Lubricants in trials.
ASBESTOLINE is applicable in and out doors in every Climate.
ASBESTOLINE requires no special application.



BELL'S ASBESTOS.

CONSISTENCY OF ASBESTOLINE.

ASBESTOLINE, to meet all circumstances, is made in four degrees of consistency—A, B, C, and CC.

ASBESTOLINE, A, is specially adapted to ordinary Land Engines and Machinery, in and out door, in this country.

ASBESTOLINE, B, a little more solid, is for use or Steamships in temperate climates, also on land when it is desirable to have Lubricant stiffer than A.

ASBESTOLINE, C, is for use in tropical climates, both ashore and afloat. It is also invaluable in works in this country when the temperature is high.

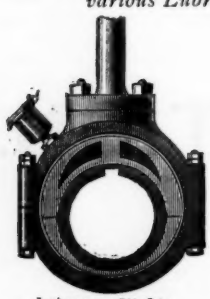
ASBESTOLINE, CC, is designed for use on Calenders, Paper-Machines, &c., where the bearings are heated by steam passing through, and sometimes is advantageously used instead of C.

The reputation of Asbestoline as a Lubricant of the highest efficiency in every kind of Machinery is established; and it has never been equalled by any other Lubricant in the numerous cases of special difficulty in which the best oils are ineffectual. It is used with marked success in Steel and Iron Works, Collieries, Cotton and Wool Mills, and other Textile Manufactories. In Corn-Mills it has proved invaluable on the roller and other modern machines. In Saw-Mills, on machines going up to 5000 revolutions per minute, its work has never been approached by any other Lubricant. On Electric Lighting Machinery, and in Steamships of all sizes throughout the world, the success of Asbestoline is unequalled. Many engines and machines of all descriptions give trouble, and show bad results both in working and wear, when the system of lubrication has not received due consideration. Engineering firms of the highest standing have given to it their powerful testimony and support.

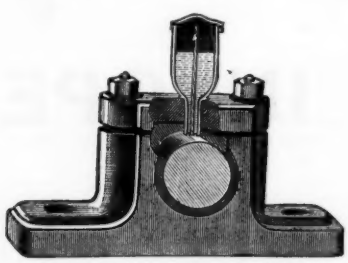
Supplied in Kegs, 28, 56, or 112 lb. Price, 2/3 per lb. Kegs Free. Special Terms for Large Quantities.

IMPORTANT TO EXPORT MERCHANTS.—*One pound of "Asbestoline" equals 2 gallons of Oil weighing 18lbs.; consequently the saving in freight is very considerable. Liberal Terms are conceded to Export Merchants.*

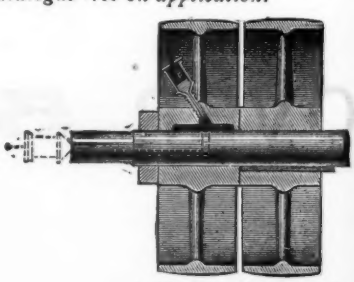
Below will be found illustrations of the mode of fixing Lubricators for Asbestoline to bearings. Full particulars of the various Lubricators supplied for Asbestoline, and the manner of fitting, in catalogue free on application.



Lubricator fitted to Eccentric of Vertical Engine



Showing Section of Lubricator fitted to ordinary Bearings.



Lubricator in different position for Loose Pulleys.

THE ATTENTION OF

ENGINEERS, AND ALL USERS OF STEAM POWER AND MACHINERY,

IS SPECIALLY INVITED TO THE FOLLOWING REPORT.

Owing to the number of Greases now offered, samples of BELL'S ASBESTOLINE were submitted to Otto Hehner, Esq., for analysis, and the subjoined Report fully proves BELL'S ASBESTOLINE to be the safest as well as the best Lubricant for all purposes:—

The Laboratory, 11, *Billiter Square, E.C., London, May* 3, 1888.

I have subjected a sample of Bell's Asbestoline taken from the stores of Messrs. J. Bell and Son, in Southwark Street, to a number of tests, in order to ascertain whether its use in Mills or Factories might contribute to the danger from Fire.

I found that Asbestoline **ignites only with the greatest difficulty** when brought into contact with flame; that wood and other combustible material soaked in Asbestoline burns, if anything, with greater difficulty than by itself; that its **flashing point is so high that it lies beyond the range of Mercurial Thermometers;** and that consequently no friction obtainable in the ordinary run of machinery is capable of developing inflammable vapours from it.

Bell's Asbestoline is **as absolutely safe a Lubricant as can be desired or obtainable.** In the case of fire breaking out from any cause, it does not assist the conflagration; and it is **quite incapable of leading to spontaneous combustion,** either by itself or in contact with inflammable material.

From the physical nature of Asbestoline its use is of necessity perfectly clean and free from waste.

(Signed) OTTO HEHNER, Public Analyst.

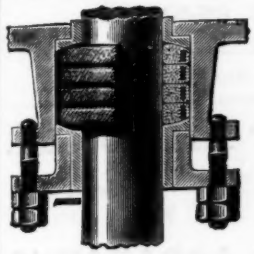
Illustrated Priced Catalogue, with numerous Testimonials by Leading Firms, free on application.

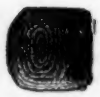
BELL'S ASBESTOS COMPANY, LIMITED,

DEPOTS—MANCHESTER: Victoria Buildings, Deansgate. **LIVERPOOL:** 2, Strand Street, James Street.

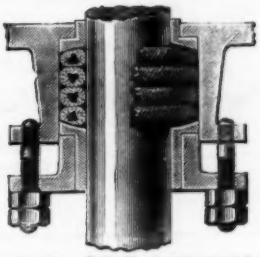
BELL'S ASBESTOS DAGGER PACKING

PATENT No. 15,496.





ROUND. SQUARE.



Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT, DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest type. The Packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

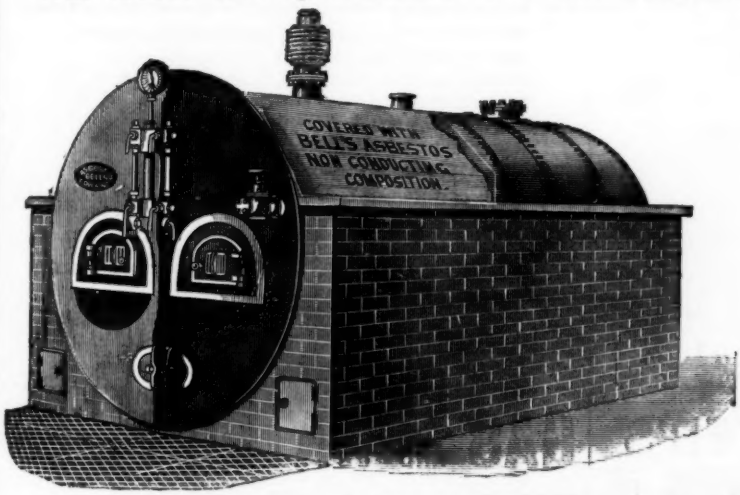
IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

Price of either Section, 5s. 6d. per lb. Steam Vulcanized, 6s. 6d. per lb.

BELL'S ASBESTOS NON-CONDUCTING COMPOSITION,

FOR COVERING BOILERS AND STEAM-PIPES,

Will reduce loss by radiation to a minimum and save 40 per cent. of fuel.



Price 25s. per Cwt.

Second Quality, 15s. per Cwt., is superior to the best sold by other Firms.

It is essential in covering that it shall not only be a non-conductor, but a substance free from whatever can injure metal, and of a nature which will enable it to adhere well for years. To do this it must be sufficiently elastic to prevent cracking and leaving, by expansion and contraction, the heated surfaces to which it is applied. This Composition is daily applied to Tanks with Round or Flat Bottoms, and its adhesive properties enable it to keep to the surfaces without bands or any device necessary for holding on other compositions. Our covering never fails to Save its Cost in a few months, lasts for years, after which it can be taken off and applied again with a little fresh. In all respects it is so superior as to be infinitely cheaper than Compositions sold at one-fourth the price. We would point out that this, being supplied dry in bag, will cover six times more surface than other materials which are sent out wet in cask. This shows the apparent low prices of other Compositions to be a sham.

For Export about one-third cost of freight is saved as compared with Compositions sent out in a wet state. In competition its never-failing efficiency has repeatedly proved it to be the cheapest material in the market for prevention of loss by radiation.

Illustrated Priced Catalogues, with numerous Testimonials from Leading Firms, free on application.

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CARDIFF: West Bute St. BIRMINGHAM: 7, John Bright St. HULL: Humber Dock Basin. GLASGOW: 35, Robertson St.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP, WESTPHAL'S PATENT.
MOST INTENSE WHITE BRILLIANT GAS LIGHT.
MOST ECONOMICAL, SIMPLE, AND DURABLE.
DOES NOT GET OUT OF ORDER.
RIVALS THE ELECTRIC LIGHT.
NO ALTERATION REQUIRED TO EXISTING FITTINGS.
BURNER, BEING A CIRCULAR SLIT, DOES NOT CHOKE UP.

PARTICULARS & PRICES POST FREE.

HENRY GREENE & SONS,
SOLE CONSIGNEES FOR GT. BRITAIN & COLONIES,
153 TO 155, CANNON STREET,
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WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

THE ALBO-CARBON LIGHT.

THE ADVANTAGES OF A WHITE, BRILLIANT, STEADY LIGHT ARE UNDENIABLE.

ENORMOUS SAVING OF GAS.

AN ACKNOWLEDGED SUCCESS. HAS STOOD THE TEST OF TEN YEARS.
Brilliancy and Softness unequalled.
Brightest, Steadiest, and Coolest of Gas-Lights.
Easily applied to existing Fittings.
Hundreds of Thousands in use.
Perfectly Simple and absolutely Safe.

Single Lights from 6/- upwards. Cluster Lights from 40/- to 145/-.

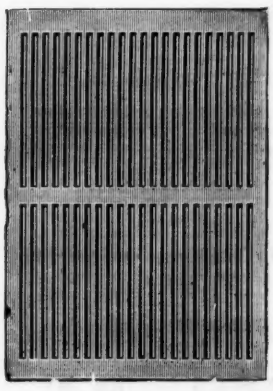
Albo-Carbon 3d. per lb., 18/- per cwt.

SEVEN PRIZE MEDALS.

Agencies Granted—Liberal Terms. Price List on application.

ALBO-CARBON LIGHT Co., Ltd.,
74c, JAMES STREET, WESTMINSTER, S.W.

R. & J. DEMPSTER'S



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Made from any kind of Timber, of any Size or Shape, by trained Workmen and specially-designed Machinery
Quick delivery and accuracy guaranteed.

BOARDS FOR SCRUBBERS

Cut and fitted upon the most successful system.

GRIDS FOR SULPHATE PLANTS.

Prices moderate. Inquiries solicited. Estimates free.

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GAS PLANT WORKS,
NEWTON HEATH, MANCHESTER.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE
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NOTTINGHAM,
OR TO
The Sole Agent,
MAURICE SCHWAB,
96, DEANSGATE, MANCHESTER.

The Apparatus has been supplied to the following Firms—
BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 APPARATUS).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
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And to the following Gas Companies and Corporations:—

ILKESTON.	BURY.	CHORLEY.
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GAS AND WATER PIPES

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CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

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AND ALL KINDS OF GAS AND WATER WORKS PLANT.

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ESTABLISHED A QUARTER OF A CENTURY. LIMITED.

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GASHOLDERS

AND GAS PLANT OF EVERY DESCRIPTION.

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THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

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ETNA WORKS,

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NEAR BIRMINGHAM

(Established 50 Years),

PATENTEES AND MANUFACTURERS OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus,

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

GAS COAL.

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REAL OLD SILKSTONE GAS COAL.

Address, THE STRAFFORD COLLIERIES COMPANY,

NEAR BARNSLEY, SOUTH YORKSHIRE.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 19-candle gas per ton.

Weight of illuminating matter in pounds of sperm, 820·80. Very free from impurities.

JOSEPH CLIFF AND SONS,

THE ORIGINAL (ESTABLISHED 1795).

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

AT THE PARIS EXHIBITION, 1878,

THREE MEDALS AND HONOURABLE MENTION

WERE AWARDED TO

JOSEPH CLIFF & SONS,

For their Various Exhibits, amongst which is a

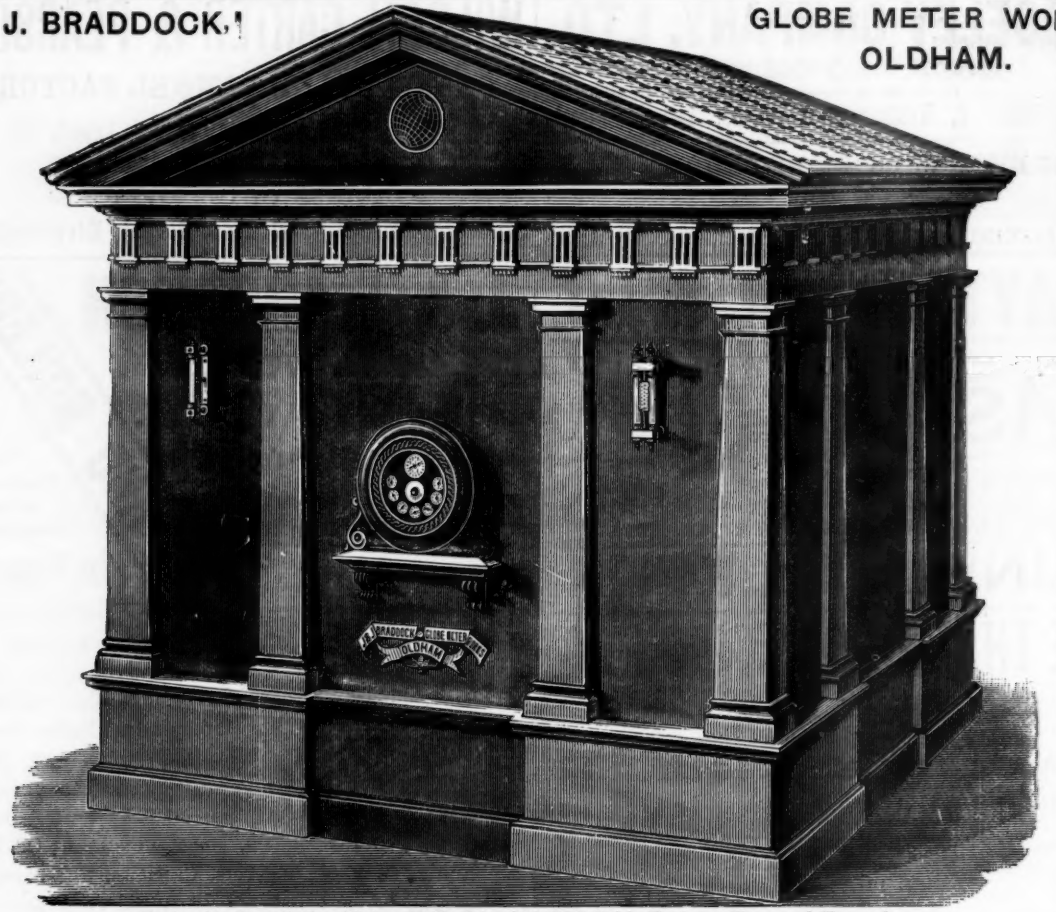
SILVER MEDAL FOR THEIR PATENT MACHINE-MADE RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this Class.

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

J. & J. BRADDOCK,

GLOBE METER WORKS,
OLDHAM.



Design for Gas Station Meters to Register 100,000 Cubic Feet per Hour and Upwards.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

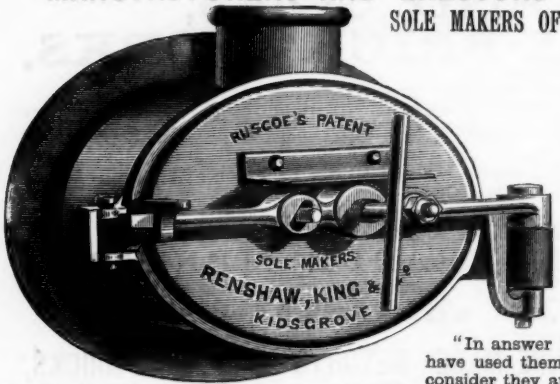
Head Office: **CORPORATION STREET, BIRMINGHAM.**

RENSHAW, KING, & Co.,

KIDSGROVE, STAFFORDSHIRE,

MANUFACTURERS AND ERECTORS OF GASHOLDERS AND GAS APPARATUS.

SOLE MAKERS OF RUSCOE'S PATENT SELF-SEALING RETORT LID AND FASTENER.



This Lid and Fastener is specially designed for taking up the wear and tear caused by refacing the Mouthpiece and Lid, hitherto in a large measure overlooked; and, in addition, from the special way in which the Lid is attached to the Cross-bar, the Lid has free action, and thus secures a more uniform scrape over the whole surface when being forced home by the Screw, the closing pressure being much more equally distributed than in any other form of fastening. The Lid itself is well ribbed, internally and externally; thus securing the Tightest, Strongest, and Simplest Lid in the Market, and the most easily adapted to existing Mouthpieces. The Cross-bar being of steel, it is not liable to be strained, and there is no Eccentric to wear and become inoperative.

"In answer to your inquiry as to Ruscoe's Patent Retort-Lids, we beg to say that we have used them in several works, and are thoroughly satisfied with their action. We consider they are the best in the market.—G. W. STEVENSON & SON."

MADE FOR ROUND, OVAL, AND D-RETORTS TO ANY REQUIRED DIMENSION. PRICE, WITH STEEL BAR AND CATCH COMPLETE, FOR 14-INCH DIAMETER MOUTH, £1 5s. OTHER SIZES IN PROPORTION.

LONDON OFFICE: FOUNDERS' HALL, 13, ST. SWITHIN'S LANE, E.C.

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